



DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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OPERATOR, ORGANIZATIONAL  
DIRECT SUPPORT AND GENERAL SUPPORT  
MAINTENANCE MANUAL

AIR CONDITIONER, HORIZONTAL, COMPACT,  
9000 BTUH 208 VOLT, 3 PHASE, 60 HERTZ  
(AMERICAN AIR FILTER CO., MODEL CH609-3)  
(4120-00-411-5444)

**WARNING**  
**HIGH VOLTAGE**

is used in the operation of this equipment.

**DEATH ON CONTACT**

or severe injury may result if personnel fail to observe safety precautions.  
Always disconnect the air conditioner from power source before performing maintenance on this equipment.  
If power must remain on for troubleshooting, exercise extreme care to avoid contact with any electric component, fan, fan motor, etc.

Do not operate the air conditioner without louvers, top covers, and guards in place and tightly secured.

**WARNING**  
**REFRIGERANT UNDER PRESSURE**

is used in the operation of this equipment.

**DEATH**

or severe injury may result if personnel fail to observe safety precautions.  
Never use a heating torch on any part that contains refrigerant-22.  
Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas.

**WARNING**

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property.  
Avoid repeated and prolonged skin contact.  
Do not use near open flame or excessive heat.

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*Table of Contents*

		Paragraph	
TER	1. INTRODUCTION		
ion	I. General.....	1-1	
	II. Description and Data.....	1-8	
TER	2. OPERATING INSTRUCTIONS		
ion	I. Operating Procedures.....	2-1	
	II. Controls and Instruments.....	2-5	
	III. Operation Under Usual Conditions.....	2-7	
	IV. Operation Under Unusual Conditions.....	2-10	2
TER	3. OPERATOR/CREW MAINTENANCE INSTRUCTIONS		
ion	I. Lubrication Instructions.....	3-1	
	II. Preventive Maintenance Checks and Services.....	3-3	
	III. Troubleshooting.....	3-5	
	IV. Operator's Maintenance of Air Conditioner.....	3-7	
TER	4. ORGANIZATIONAL MAINTENANCE INSTRUCTIONS		
ion	I. Service Upon Receipt of Material.....	4-1	
	II. Movement to a New Worksite.....	4-3	
	III. Repair Parts, Special Tools and Equipment.....	4-4	
	IV. Lubrication.....	4-7	
	V. Preventive Maintenance Checks and Services.....	4-9	
	VI. Troubleshooting.....	4-11	
	VII. Radio Interference Suppression.....	4-13	
VIII.	Maintenance of Covers, Lenses and Filters.....	4-16	

# Table of Contents (Cont)

Paragraph

CHAPTER	5.	DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS	
Section	I.	Repair Parts, Special Tools and Equipment.....	5-1
	II.	Troubleshooting.....	5-4
	III.	General Maintenance Instructions.....	5-5
	IV.	Removal and Installation of Major Components and Assemblies.....	5-16
CHAPTER	6.	REPAIR INSTRUCTIONS	
Section	I.	Refrigeration System.....	6-1
APPENDIX	A.	REFERENCES .....	
	B.	MAINTENANCE ALLOCATION CHART .....	
	C.	BASIC ISSUE ITEM LIST, ITEMS TROOP INSTALLED OR AUTHORIZED LIST .....	
ALPHABETICAL INDEX .....			

## List of Illustrations

Number	Title
1-1	Air conditioner, left front, 3/4 view.....
1-2	Air conditioner, right rear, 3/4 view.....
1-3	Air conditioner, top view, top covers removed.....
1-4	Control system schematic diagram.....
1-5	Wiring diagram.....
2-1(A)	Base mounting holes.....
2-1(B)	Typical installation of air conditioner to enclosure.....
2-2	Ground wire installation.....
2-3(A)	Controls and instruments.....
2-3(B)	Controls and instruments.....
2-3(C)	Controls and instruments.....
2-4	Starting instructions for cooling.....
2-5	Operating instructions for cooling.....
2-6	Starting instructions for heating.....
2-7	Operating instructions for heating.....
2-8	Operating instructions for ventilating.....
2-9	Air conditioner shutdown instructions.....
4-1	R. F. I. capacitors.....
4-2	Evaporator air louvers, air filter and mist eliminator.....
4-3	Fresh air vent screens, condenser guard and condenser louver blades.....
4-4	Louver blade push-on nuts and louver control attachment.....
4-5	Housing covers.....
4-6	Evaporator drain tubing.....
4-7	Vent damper control.....
4-8	Vent damper.....
4-9	Heater thermostatic switch, exploded view.....
4-10	Heater elements and support.....
4-11	Evaporator fan and motor assembly.....
4-12	Condenser fan and motor.....
4-13	Condenser fan motor and mounting plate, exploded view.....
4-14	Motor thermal protector housing.....
4-15	Condenser fan motor thermostatic switch.....
4-16	Control module connector knob and bulk mounting.....

Number	Title
5.4	Condenser coil, removal and installation.....
5.5	Condenser louver control, removal and installation.....
5.6	Condenser louver actuator cylinder, removal and installation.....
5.7	Charging valves, pressure relief valve, and pressure switch connections, removal and installation.....
5.8	Dehydrator, receiver and solenoid valves, removal and installation.....
5.9	Thermal expansion valve, removal and installation.....
5.10	Quench valve and pressure regulator valve, removal and installation.....
6.1	Discharging and purging refrigerant system.....
6.2	Charging the refrigerant system (Sheet 1 of 2).....
6.2	Charging the refrigerant system (Sheet 2 of 2).....
6.3	Solenoid valve, exploded view.....
6.4	Fan motor, exploded view.....
6.5	Control module, exploded view.....

*List of Tables*

Number	Title
3.1	Operator/Crew Preventive Maintenance Checks and Balances.....
3.2	Troubleshooting.....
4.1	Organizational Preventive Maintenance Checks and Balances.....
4.2	Troubleshooting.....
5.1	Troubleshooting.....
6.1	Normal Operating Pressures.....

# CHAPTER 1

## INTRODUCTION

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### Section I. GENERAL

#### 1-1. Scope

This manual is for your use in operating and maintaining the AAF Model CH609-3 air conditioner.

#### 1-2. Maintenance Forms and Records

Maintenance forms and records that you are required to use are explained in TM 38-750.

#### 1-3. Reporting of Errors

You can improve this manual by calling attention to errors and by recommending improvements. You will find several copies of DA Form 2028-2 (TEST) (Recommended Changes to Equipment Technical Manuals) in the back of this manual; there is also a sample of DA Form 2028-2, properly filled out. If these have already been used, you may submit your ideas on DA Form 2028 or in a letter. Mail DA Form 2028-2, DA Form 2028 or your letter to: Commander, U. S. Army Troop Support and Aviation Materiel Readiness Command,

ATTN: DRSTS-MTP, 4300 Goodfellow Blvd.,  
St. Louis, MO 63120. A reply will be furnished  
to you. Thanks for your help.

#### 1-4. Equipment and Serviceability Materiel

This equipment is not covered by an ESC.

#### 1-5. Destruction of Army Materiel Prevent Enemy Use

Instructions for destruction of materiel  
prevent enemy use will be in accordance with T  
244-3 (Procedures for Destruction of Equipm  
Prevent Enemy Use).

#### 1-6. Administrative Storage

Preparation, care and removal of equipm  
administrative storage will be in accordanc  
the applicable requirements of TM 740-90-  
ministrative Storage of Equipment).

#### 1-7. Difference Between Models

This manual covers only AAF Model CH

CONDENSER  
COVER

JUNCTION  
BOX

MAIN POWER  
RECEPTACLE

AIR OUTLET  
LOUVER

LIFTING  
HANDLE

CONTROL  
MODULE

EVAPORATOR  
AIR INLET  
LOUVER

TS 4120-352-14/1-

#### SHIPPING DIMENSIONS

LENGTH	26.0 INCHES (66 CM)
HEIGHT	16.0 INCHES (40-1/2 CM)
WIDTH	23.8 INCHES (60 CM)
VOLUME	5.7 CUBIC FEET (.17 M <sup>3</sup> )



LIQUID  
SIGHT  
INDICATOR

MAIN POWER  
RECEPTACLE  
(ALTERNATE  
LOCATION)

CONDENSER  
GUARD

CONDENSER  
COIL

HIGH-LOW  
CONDENSER FAN  
THERMOSTATIC CUTOUT

FRESH AIR  
INLET SCREEN

DRAIN HOLE

CONDENSER  
AIR DISCHARGE  
LOWER

TS 4120-352-14/1-

## Section II. DESCRIPTION AND DATA

### 1-8. Description

*a. General.* Air conditioner model CH609-3 (figures 1-1 thru 1-3) is a lightweight, compact, horizontal unit designed for cooling and heating air to a desired predetermined range, and circulating the conditioned air to provide heating or cooling of equipment or personnel within the air-conditioned area.

*b. Evaporator Section.* The evaporator section contains the evaporator coil, fan motor and fan, control module and junction box, air filter, heating elements and thermal expansion valve. When cooling, air in the evaporator section is forced over the evaporator coil by the evaporator fan which lowers the temperature of the air before it is distributed into the space to be conditioned. When heating, air is circulated over the heating elements and distributed by the evaporator fan. Evaporator fan speed is controlled by a selector switch located on control module.

*c. Condenser Section.* The condenser section contains the hermetically sealed motor compressor, condenser coil, condenser fan and motor, actuator, service valves, filter dryer, equalizer solenoid valve, liquid quench valve, pressure regulator valve, electrical power connectors, and the necessary refrigerant. The compressor mechanically compresses refrigerant vapor to a condensing condition and discharges it into the condenser coil through the hot gas line. Outside air, drawn over the condenser coil surface by the condenser fan, condenses the refrigerant vapor to a liquid. The liquid then leaves the condensing coil and returns to the thermal expansion valve through the liquid line. Condenser fan speed is controlled with a thermostatic switch located on rear of unit. At ambient temperature of  $100^{\circ}\text{F} + 5^{\circ}\text{F}$  ( $38^{\circ}\text{C} + 3^{\circ}\text{C}$ ) or above, the condenser fan speed will turn at high speed, but at ambient temperature below  $100^{\circ}\text{F} + 5^{\circ}\text{F}$  ( $38^{\circ}\text{C} + 3^{\circ}\text{C}$ ) the condenser fan will turn at low speed. Due to residual mass heat there will be a delayed reaction time for this to happen when ambient temperature drops below the  $100^{\circ}\text{F}$  ( $38^{\circ}\text{C}$ ) changeover point.

CONDENSER FAN  
HOUSING

LOUVER  
PUSH-PULL  
CONTROL

CONDENSER  
COIL

COMPRESSOR

DEHYDRATO

CHARGING  
VALVE

PRESSURE  
RELIEF  
VALVE

QUENCH  
EXPANSION  
VALVE

LIQUID  
SOLENOID  
VALVE

EXPANSION  
VALVE

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HOUSING

PUSH-PULL  
CONTROL

COIL

CHARGING  
VALVE

PRESSURE  
RELIEF  
VALVE

QUENCH  
EXPANSION  
VALVE

LIQUID  
SOLENOID  
VALVE

EXPANSION  
VALVE

TS 4120-352-14/1-31

EVAPORATOR COIL

LIQUID ACTUATOR CYLINDER

HEATING

## 1-9. Identification and Tabulated Data

**a. Identification.** Each air conditioner has one major identification plate mounted on the side of the unit. The plate specifies nomenclature, manufacturer, military part number, BTU/hr., phase, hertz, volts, serial number, contract number, and shipping weight. A manufacturer's identification plate mounted just below the military plate contains the manufacturer's name and address and the model and serial numbers.

### b. Tabulated Data, General.

(1) Air conditioner, model CH 609-3.

Nomenclature.....	Air conditioner, horizontal, compact
Manufacturer.....	American Air Filter Co., Inc.
Capacity.....	
Cooling.....	9,000 BTU/hr.
Heating.....	7,000 BTU/hr.
Phase.....	3
Hertz.....	50/60
AC volts.....	208

### (2) Dimensions and weights.

Length.....	26 in. (66 cm.)
Height.....	16 in. (40-1/2 cm.)
Width.....	23-3/4 in. (60 cm.)
Weight.....	191 lbs. (87 kg.)

### c. Tabulated Data, Components Subject to Operator Maintenance.

(1) Condenser fan motor (B2) and/or evaporator fan motor (B3).

Manufacturer.....	IMC Magnetics Corp.
Model.....	FBT4625-3 (modified by marking "97403 13216E6140-3")
Volts.....	208
Hertz.....	50/60
Phase.....	3
RPM.....	3450/1725
Horsepower:	
High.....	0.73
Low.....	0.16
Amperes:	
High.....	2.3
Low.....	0.9
Duty.....	Continuous
Motor drive.....	Direct
Thermal protector.....	Automatic reset type
High.....	opens at 250°F + 9°F (120°C + 5°C)

Low..... opens at 300°F + 10°F (150°C + 5°C)

Rotation (Facing shaft end)..... Counterclockwise

### (2) Compressor (includes crankcase heater)

Manufacturer.....	Welco Industries, Inc.
Model.....	MIL-R-9-VAC-620 (modified by marking "97403 13208E4182")
Oil charge.....	24 ounces (.7 kg)
Volts.....	208
Hertz.....	50/60
Phase.....	3
Weight (with oil).....	47-1/4 pounds (21.5 kg)

### (3) Solenoid valves (L1 and L2).

Manufacturer.....	Jacks-Evans Mfg. Co.
Part number.....	OB2S3 (modified by marking "97403 13216E6158")
Type.....	Pilot operated diaphragm type, normally open (when not energized)
Volts.....	24 DC

### (4) Heater element (HR1 through HR6).

Manufacturer.....	Edwin L. Weigand Co.
Part number.....	12-112163 (modified by marking "97403 13216E6124-2")
Sheath.....	Nickel-iron-chromium alloy, tubular type
Element.....	Nickel-chromium
Volts.....	120
Watts.....	315

### (5) Liquid sight indicator.

Manufacturer.....	Sporlan Valve Co.
Part number.....	SA12S (modified by marking "97403 13216E6155")

### d. Tabulated Data, Components Subject to Organizational Maintenance.

#### (1) Compressor Circuit Breaker (CB-1).

Manufacturer.....	Heinemann Electric
Part number.....	JA3218-1 (modified by marking "97403 13216E6205-1")
Type.....	3 PST, series trip with mechanically actuated auxiliary switch

#### (2) Control circuit breaker (CB2).

Manufacturer.....	Texas Instruments, Inc.
Part number.....	2MC-102-1 (modified by marking "97403 13216E6178-1")
Type.....	SPST, series trip



### (3) Rectifier (CR1).

Manufacturer..... Motorola Semiconductor Products, Inc  
Part number..... MDA952-3 (modified by marking "97403 13216E6223")

### (4) Time delay relay (K1).

Manufacturer..... E. V. Naylor Laboratories, Inc.  
Part number..... TQ1D25 (modified by marking "97403 13216E6182")  
Alternate..... HLG Inc., Part No. 1600-3590 (modified by marking)  
Type..... SPDT  
Time delay..... 25 + 6 seconds

### (5) Heater relay (K2).

Part number..... MS24192D1  
Type..... 3 PST, normally open  
Volts..... 28 VDC

### (6) Compressor motor relay (K3)

Part number..... MS24192D1  
Type..... 3 PST, normally open  
Volts..... 28 VDC

### (7) Condenser fan relay (K4).

Manufacturer..... Potter and Brumfield  
Part number..... KA4619 (modified by marking "97403 13216E6184")  
Type..... 3 PDT, armature type  
Coil voltage..... 24 VDC

### (8) R. F. I. capacitor (C1).

Type designation..... CK14AX103K  
Specification..... MIL-C-11015/20A  
Type..... Fixed  
Dielectric..... Ceramic  
Capacitance..... 10,000 pf + 10 pf

### (9) R. F. I. capacitor (C2 or C6).

Manufacturer..... Paktron  
Part number..... Paktron WA .056  
Type..... Fixed  
Dielectric..... Mylar  
Capacitance..... 0.056 mfd + 10%  
Working voltage..... 400 VDC

### (10) Rotary selector switch (S1).

Manufacturer..... Ark-Les Switch Corp.  
Part number..... 2267A1 (modified by marking "97403 13216E6201")  
Type..... 8 PDT, 4 switch wafers

Part number..... 8906K1462 (modified by marking "97403 13216E6200")  
Type..... 3 PDT, slow make, slow break contacts

### (12) Temperature selector switch (S3).

Manufacturer..... Penn controls, Inc  
Part number..... A19AGE23 (modified by marking "97403 13216E6203-1")  
Type..... SPDT  
Temperature range..... 60°F to 90°F

### (13) High pressure switch (S4).

Manufacturer..... Penn Controls, Inc  
Part number..... P20DA-18 (modified by marking "97403 13216E6215-3")  
Type..... SPST, normally closed, with tri free manual reset  
Pressure setting..... 445° + 10 psig

### (14) Low pressure switch (S5).

Manufacturer..... Penn Controls, Inc.  
Part number..... P20BA-16 (modified by marking "97403 13216E6215-1")  
Type..... SPST, normally closed, with tri free manual reset  
Pressure setting..... 15 + 5 psig

### (15) Heater thermostatic switch (S6).

Manufacturer..... Therm-O-Disc, Inc.  
Part number..... HLAS4947 (modified by marking "97403 13216E6224")  
Type..... DPST, normally closed, bimetallic  
Reset..... Automatic  
Contacts open..... (temp. rise)..... 150°F + 5°F (65.5°C + 3°C)  
Contacts close..... (temp. drop)..... 110°F + 5°F (43°C (3°C)

### (16) Condenser fan relay thermostatic switch (S7).

Manufacturer..... Thermo-O-Disc, Inc.  
Part number..... 14T22 (modified by marking "97403 13216E6217") and changing mounting holes to slots)  
Type..... SPST, normally open, non-adjustable bimetallic disc  
Contacts close..... (temp. rise)..... 100°F + 5°F (38°C + 3°C)

### (17) Transformer (T1).

(18) Thermal expansion valve.

Manufacturer..... Alco Controls Corp.  
Part number..... HNE1HW100-6A (modified by  
marking "97403 13216E6160-1")  
Inlet..... 1/4 ODF  
Outlet..... 3/8 ODF  
Cap tube length..... 30"  
Nominal capacity..... 1 ton  
Superheat.....  
(factory set)..... 6°F + 1/2°F at a 32°F bath tem-  
perature (3.1/3°C + 1/3°C at a 0°C  
bath temperature)

(19) Liquid quench valve.

Manufacturer..... Alco Controls Corp.  
Part number..... HN1/4CW16A (modified by mark-  
ing "97403 13216E6174-1")  
Inlet..... 1/4 ODF  
Outlet..... 3/8 ODF  
Cap tube length..... 30"  
Nominal capacity..... 1/4 ton  
Superheat.....  
(factory set)..... 16°F + 1/2°F at a 32°F bath tem-  
perature 9°C + 1/3°C at a 0°C bath  
temperature

(20) Refrigerant service valves.

Manufacturer..... Robinsair  
Part number..... V25-4

Manufacturer..... Controls Co. of America  
Model number..... 104A  
Part number..... 70034-187 (modified by ma-  
"97403 13216E6171")  
Adjustment range..... 0 to 80 psig  
Setting..... 08 psig

(22) Dehydrator.

Manufacturer..... Alco Valve Co.  
Part number..... ADK032 (modified by ma-  
"97403 13216E5918-1")  
Type..... Sealed and nonrefillable

(23) Actuator cylinder assembly.

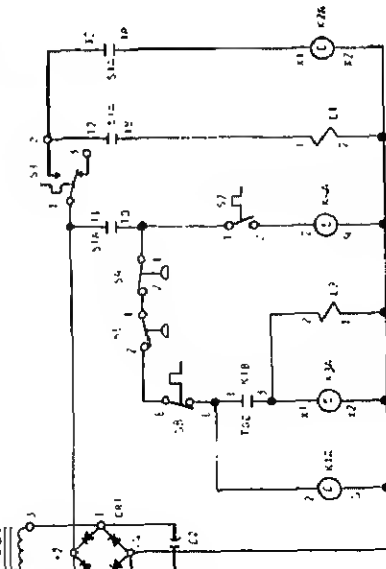
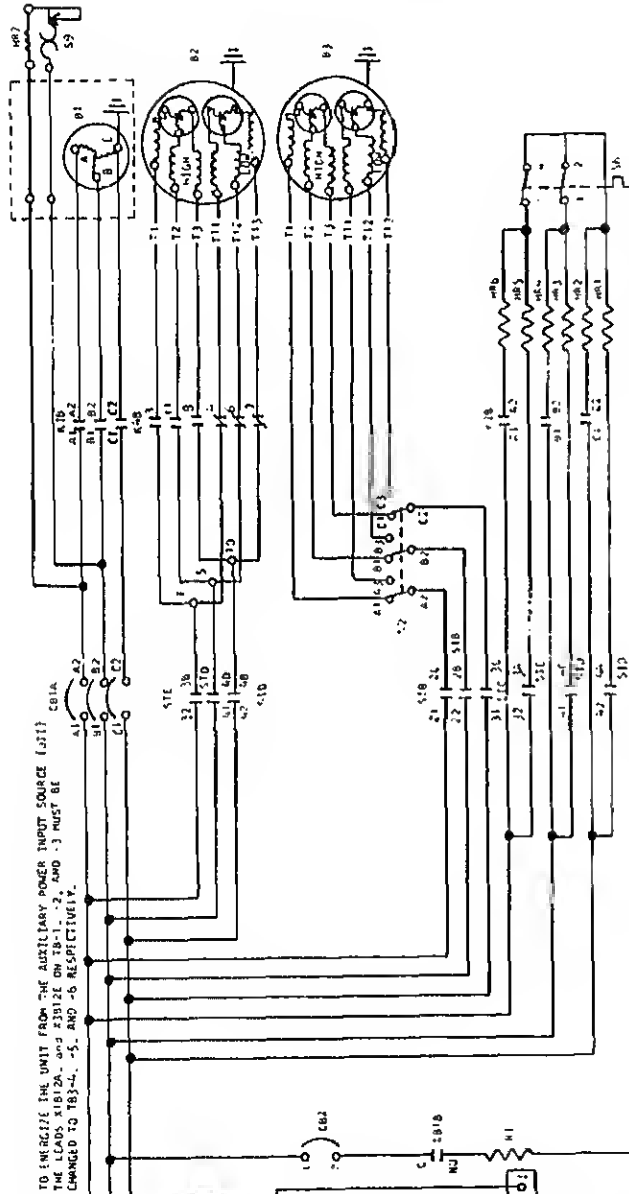
Manufacturer..... Robertshaw Control Co.  
Part number..... PO11-22 (modified by ma-  
"97403 13216E6128" and char-  
cable attachment plate  
Stroke..... .952 in.  
Full stroke pressure  
(no load)..... 240 + 20 psig  
Pressure to  
start stroke.....  
stroke..... 165 + 15 psig

1-10. Diagrams.

a. *Control system schematic diagram.* Refer to figure 1-4 for system electrical schematic diagram.



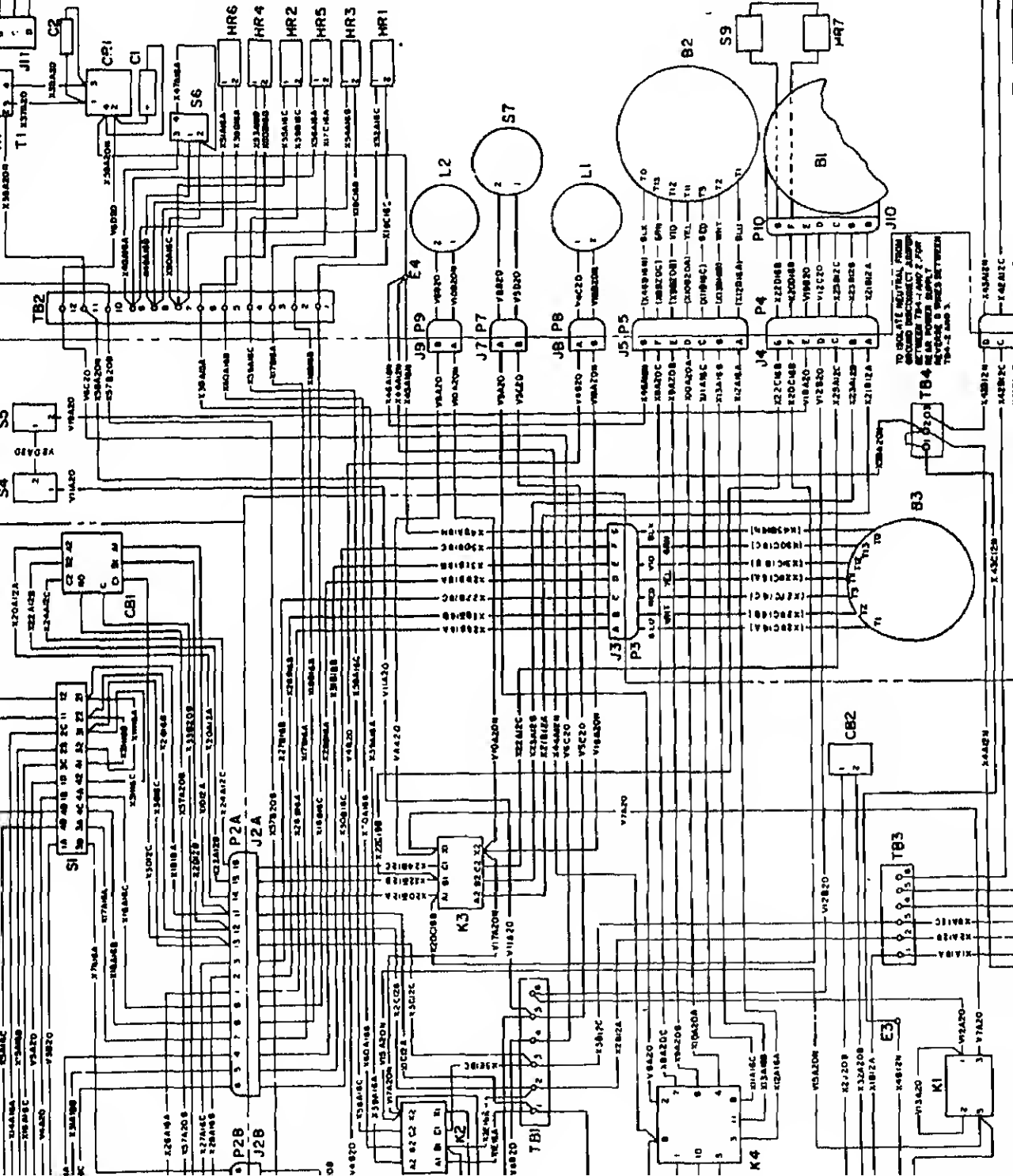
TO ENERGIZE THE UNIT FROM THE AUXILIARY POWER INPUT SOURCE (J21) COIA  
THE LOADS 1810N, 1810S, 1810T, 1810U, 1810V, 1810W, 1810X, 1810Y, AND 1810Z  
CHANGED TO 1810A, 1810B, 1810C, 1810D, 1810E, 1810F, 1810G, 1810H, 1810I, 1810J, 1810K, 1810L, 1810M, 1810N, 1810O, 1810P, 1810Q, 1810R, 1810S, 1810T, 1810U, 1810V, 1810W, 1810X, 1810Y, AND 1810Z



SELECTOR SWITCH POSITION	SWITCH FUNCTION	SWITCH WIRING AND TERMINALS CONNECTED				
		SW1	SW2	SW3	SW4	SW5
1	HEAT INPUT	17 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C 32 AND 3A	41 AND 4C 42 AND 4A	
2	HEAT INPUT	12 AND 1A	23 AND 2C 22 AND 2B	31 AND 3C		
3	OFF	-	-	-	-	
4	VENT	-	21 AND 2C 22 AND 2B	31 AND 3C	-	
5	COOL INPUT	12 AND 1B 11 AND 1C	21 AND 2C 22 AND 2B	32 AND 3B 31 AND 3C	42 AND 4B 41 AND 4C	

COMPONENT REFERENCE LIST	DESCRIPTION
1810A	COMPRESSOR, ROTARY
1810B	MOTOR, CONDENSER FAN
1810C	MOTOR, EVAPORATOR FAN
1810D	CAPACITOR, FILTER
1810E	CAPACITOR, FILTER
1810F	CAPACITOR, FILTER
1810G	CAPACITOR, FILTER
1810H	CAPACITOR, FILTER
1810I	CAPACITOR, FILTER
1810J	CAPACITOR, FILTER
1810K	CAPACITOR, FILTER
1810L	CAPACITOR, FILTER
1810M	CAPACITOR, FILTER
1810N	CAPACITOR, FILTER
1810O	CAPACITOR, FILTER
1810P	CAPACITOR, FILTER
1810Q	CAPACITOR, FILTER
1810R	CAPACITOR, FILTER
1810S	CAPACITOR, FILTER
1810T	CAPACITOR, FILTER
1810U	CAPACITOR, FILTER
1810V	CAPACITOR, FILTER
1810W	CAPACITOR, FILTER
1810X	CAPACITOR, FILTER
1810Y	CAPACITOR, FILTER
1810Z	CAPACITOR, FILTER

b. *Wiring Diagram.* Refer to figure 1-5 for system wiring diagram.





# OPERATING INSTRUCTIONS

## WARNING

If equipment fails to operate refer to troubleshooting procedures in chapter 3.

## Section I. OPERATING PROCEDURES

### 2-1. Unloading Equipment

The total weight of the air conditioner is 191 pounds (87 kg.). Use a hand truck or forklift of at least 300 pounds capacity to unload the unit. Keep unit upright during the unloading operation.

### 2-2. Unpacking Equipment

Moves the unit as near to the site of installation as possible. Remove crating hardware and metal straps, being careful not to damage the unit with the tools used for uncrating.

### 2-3. Inspecting and Servicing Equipment

*a. Inspection.* Inspect the entire air conditioner for signs of damage, missing or loose hardware, and any defects that may have been incurred during shipment. Make a thorough check to see that all wiring, lines, and tubing are secure; and pay particular attention to the evaporator and condenser coils and main power receptacle connectors. Be sure that visible wiring and insulation are not frayed or broken. Check the evaporator and condenser fan motors. Report all damage and defects to or-

ganizational maintenance.

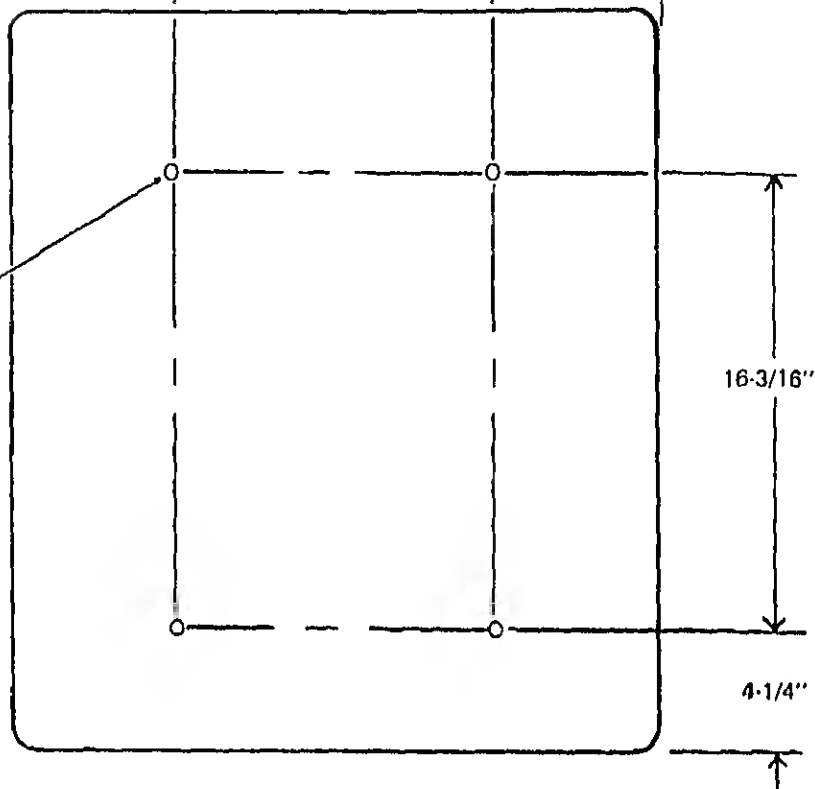
*b. Servicing.* Perform the daily preventive maintenance services listed in paragraph 3-4. Be sure all hardware is securely in place.

### 2-4. Installation

*a. General.* The air conditioner is shipped assembled and ready for operation. It contains a charge of refrigerant and compressor oil. Install unit on a firm, level surface to allow proper condensate drainage. Place it so that the control panel and condenser and evaporator louvers are accessible to the operator and to maintenance personnel. Be sure there are no obstructions in front of any air intake or discharge louvers or other openings. Obstructions may cause insufficient flow of air into or out of the air conditioner. If the unit is van mounted, remove any such obstructions to organizational maintenance.

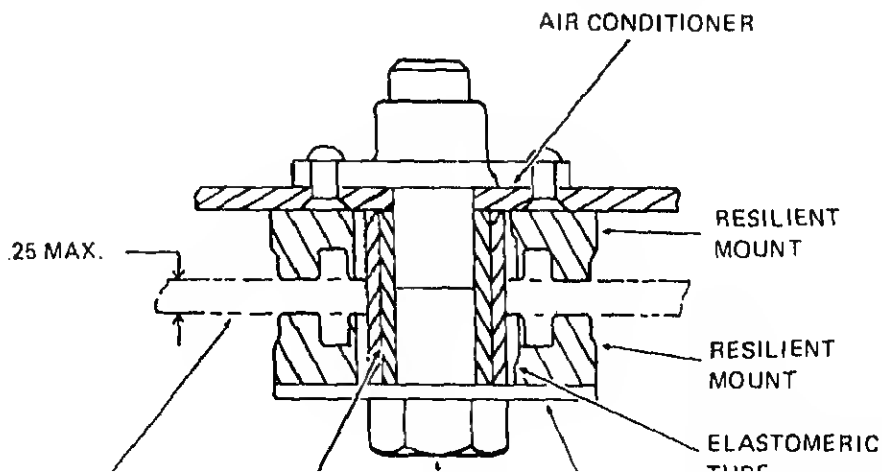
*b. Mounting.* Base mounting hole dimensions are shown on figure 2-1(A). The resilient mounting parts shown in figure 2-1(B) are shipped with the air conditioner.

3/4-24 UNF  
MOUNTING  
HOLES



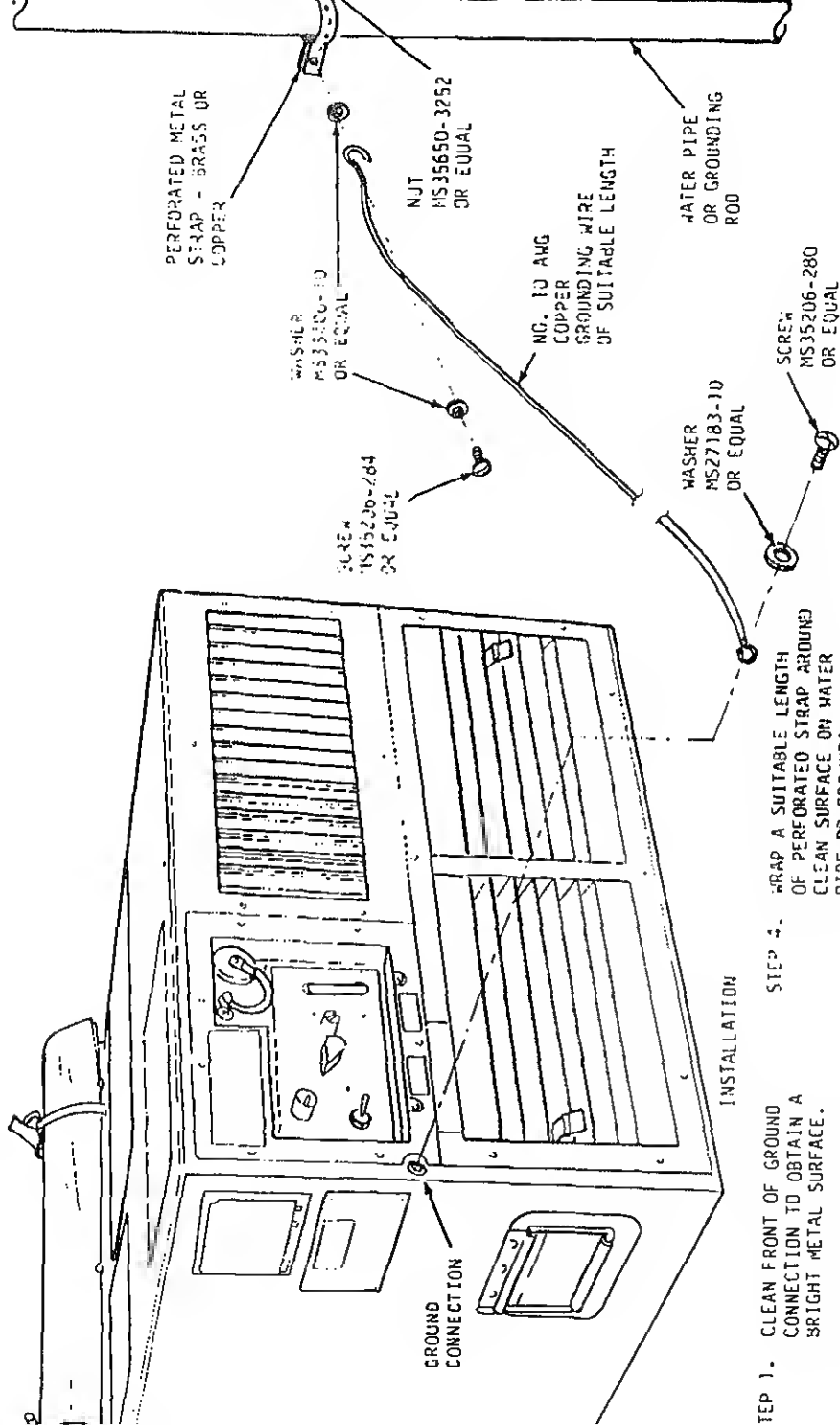
TS 4120-352-14/2-1(A).

Figure 2-1(A). Base mounting holes.



# CAUTION

Life operation connect a No. 10 (min.) ground wire to ground connection, as shown in figure 2-2.



STEP 1. CLEAN FRONT OF GROUND CONNECTION TO OBTAIN A BRIGHT METAL SURFACE.

STEP 2. REMOVE INSULATION FROM ENDS OF GROUNDING WIRE OR USE BARE WIRE. MAKE LOOP AT WIRE ENDS.

STEP 3. USING 1/4-20 SCREW AND WASHER, ATTACH ONE END OF WIRE TO AIR CONDITIONER FRONT PANEL GROUND.

STEP 4. WRAP A SUITABLE LENGTH OF PERFORATED STRAP AROUND CLEAN SURFACE ON WATER PIPE OR GROUNDING ROD. DO NOT USE GAS PIPE.

STEP 5. USING 1/4-20 SCREW, TWO WASHERS AND NUT, ATTACH OTHER END OF GROUNDING WIRE TO STRAP IN A MANNER SUCH AS TO SECURELY TIGHTEN STRAP TO PIPE AND WIRE TO STRAP.

*d. Air Ducts.* Connect air ducts contingent to site of installation. Mount air filter in duct work if an evaporation return air duct is required.

NOTE

Operation without filtration will clog coils.

## **Section II. CONTROLS AND INSTRUMENTS**

### **2-5. General**

This section describes, locates and illustrates the various controls and provides the operator/crew sufficient information to insure proper operation of the air conditioner

### **2-6. Controls and Instruments**

The location and the function of the controls instruments are illustrated in figure 2-3.



TEMPERATURE  
SELECTOR  
SWITCH,  
TURN TO  
DESIRED  
TEMPERATURE

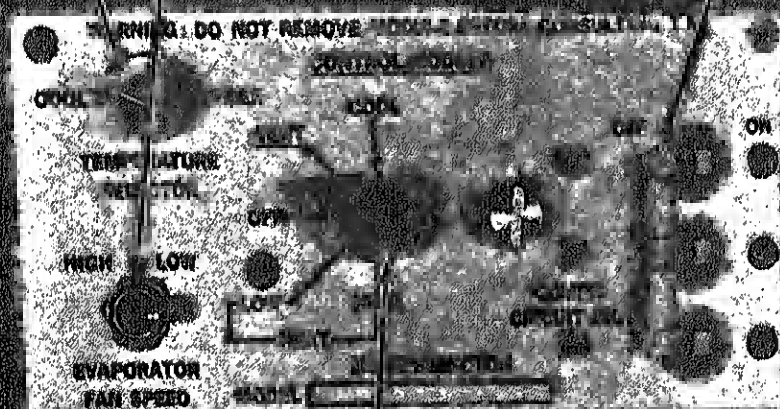
EVAPORATOR  
FAN SPEED  
SWITCH,  
MOVE LEVER  
TO HIGH OR  
LOW SPEED  
POSITION

ON-OFF  
CIRCUIT BREAKER  
SWITCH

MAIN POWER  
RECEPTACLE

COMPRESSOR  
CIRCUIT BREAKER,  
MOVE TO ON  
POSITION TO RESET

FOR SWIRL OPERATION  
SEE INSTRUCTIONS  
INTERNAL OR EXTERNAL  
GROUNDING



LOW PRESSURE  
CUTOFF SWITCH,  
PUSH TO RESET

MODE SELECTOR SWITCH,  
TURN TO DESIRED  
MODE OF OPERATION

HIGH PRESSURE  
CUTOFF SWITCH,  
PUSH TO RESET

TS 4120-352-14/2-3(A)

Figure 2-3A. Controls and instruments

VENT CONTROL ACTUATOR  
TURN UPWARD TO CLOSE VENT,  
TURN DOWNWARD TO OPEN VENT

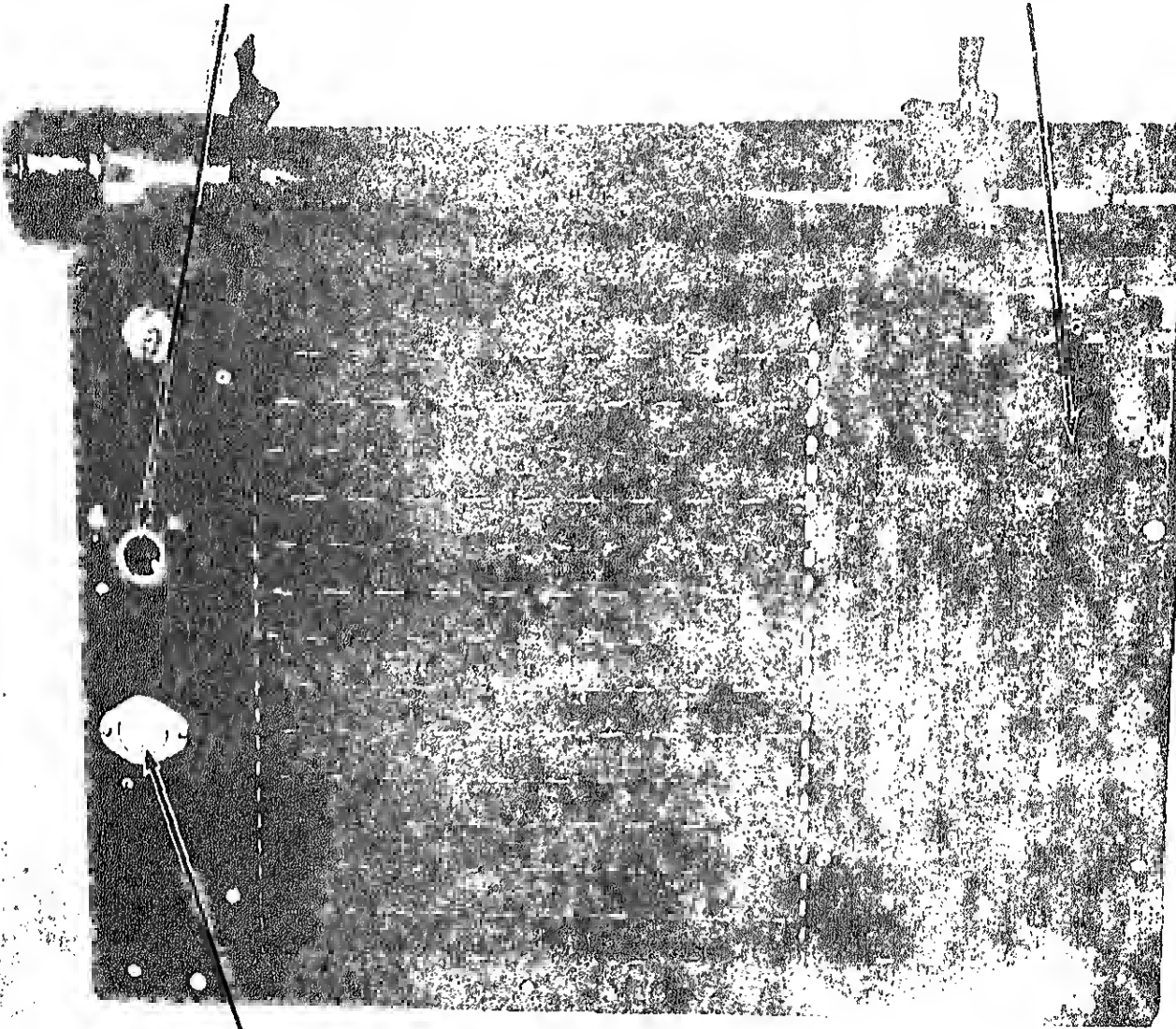
VENT CONTROL ACTUATOR  
TURN UPWARD TO CLOSE VENT,  
TURN DOWNWARD TO OPEN VENT

87-403

1371

LIQUID SIGHT INDICATOR,  
MILKY OR CLOUDY FLUID OR BUBBLES  
INDICATE INSUFFICIENT CHARGE OR  
CONTAMINATED REFRIGERANT SYSTEM

LOUVER ASSEMBLY,  
AUTOMATICALLY CONTROLLED  
BY ACTUATOR CYLINDER



CONDENSER FAN RELAY THERMOSTATIC SWITCH,  
CLOSES HIGH SPEED CIRCUIT ON  
TEMPERATURE RISE AT 100°F

TS 4120-352-14/2-3C

## **-7. General**

*a.* The instructions in this section are published for the information and guidance of the personnel responsible for the operation of the air conditioner.

*b.* The operator must know how to perform every operation of which the air conditioner is capable. This section gives instructions on starting and stopping the air conditioner, and detailed operating instructions. Since nearly every condition presents a different problem, the operator may have to vary the given procedure to fit the condition.

## **2-8 Starting and Operating Instructions.**

*a. Preparation for Starting.*

- (1) Perform the daily preventive maintenance service (para 3-4).
- (2) Connect the main power cable.
- (3) Check drain holes to insure that they are open.
- (4) Be sure the unit is firmly secured.
- (5) Roll up condenser cover and tie at top of air conditioner to clear condenser opening.

### **NOTE**

When vent damper door is open to admit fresh air, partially close evaporator inlet louver to balance incoming air. Keep vent or damper door closed during heavy rain.

*b. Starting Instructions for Cooling.* Start the air conditioner for cooling as shown in figure 2-4.

*c. Operating Instructions for Cooling.* Operate the air conditioner for cooling as shown by figure 2-5.

*d. Starting Instructions for Heating.* Starting the air conditioner for heating as shown in figure 2-6.

*e. Operating Instructions for Heating.* Operate the air conditioner for heating as shown in figure 2-7.

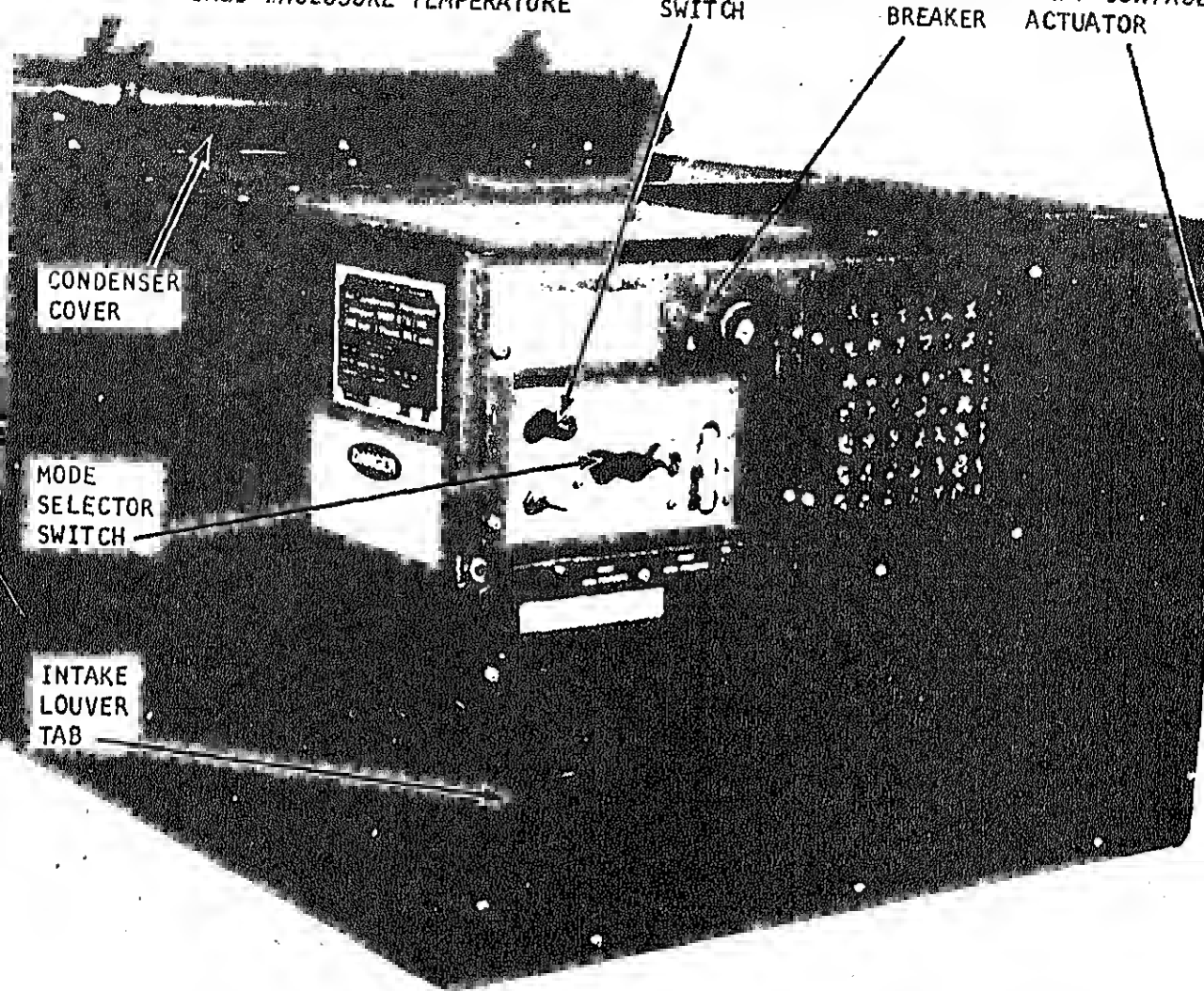
*f. Operating Instructions for Ventilation.* Operate the air conditioner for ventilation as shown by figure 2-8.

## **2-9. Stopping Instructions**

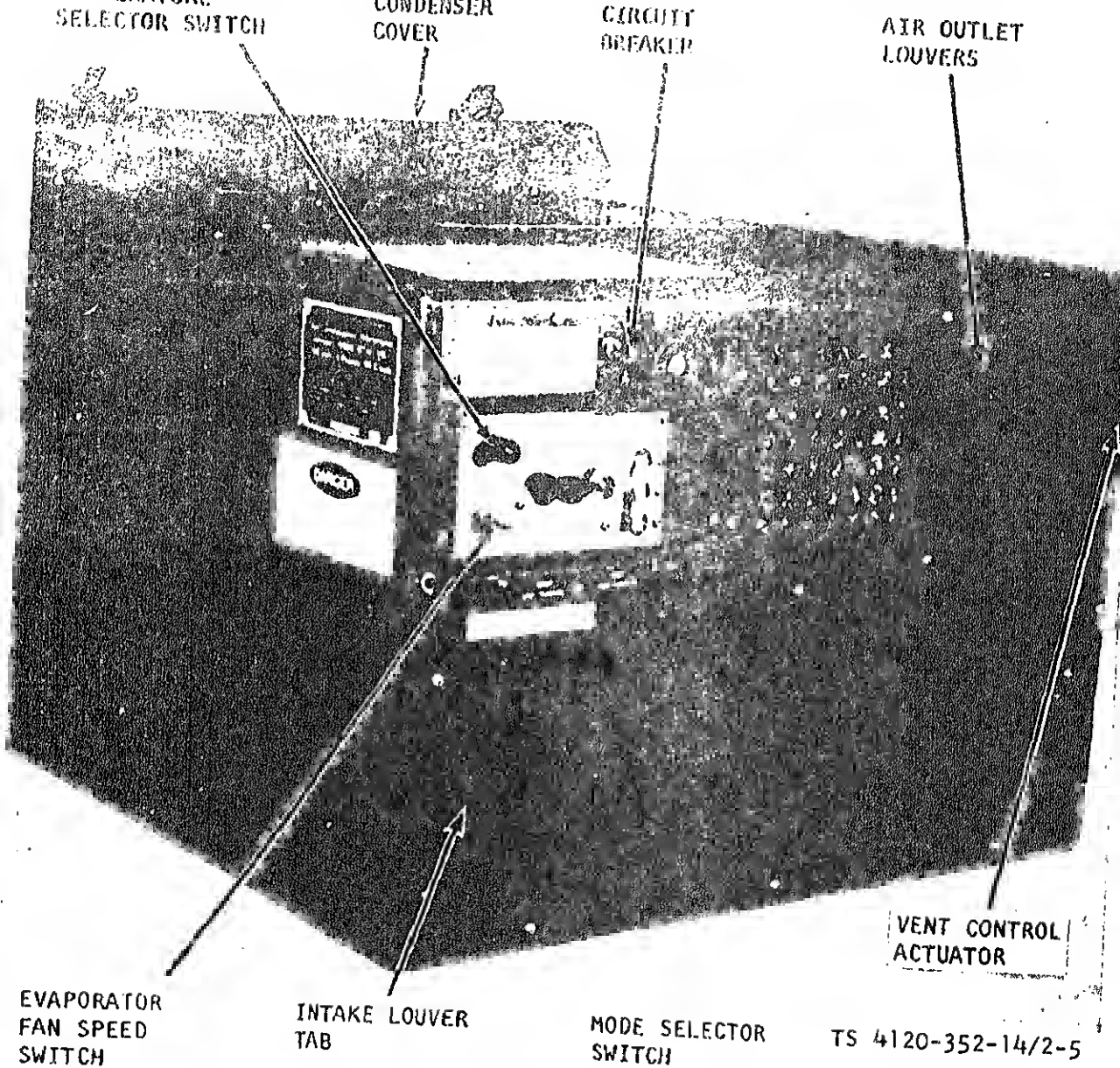
*a.* Stop the air conditioner as shown by figure 2-9.

*b.* Perform the daily preventive maintenance service (para 3-4).



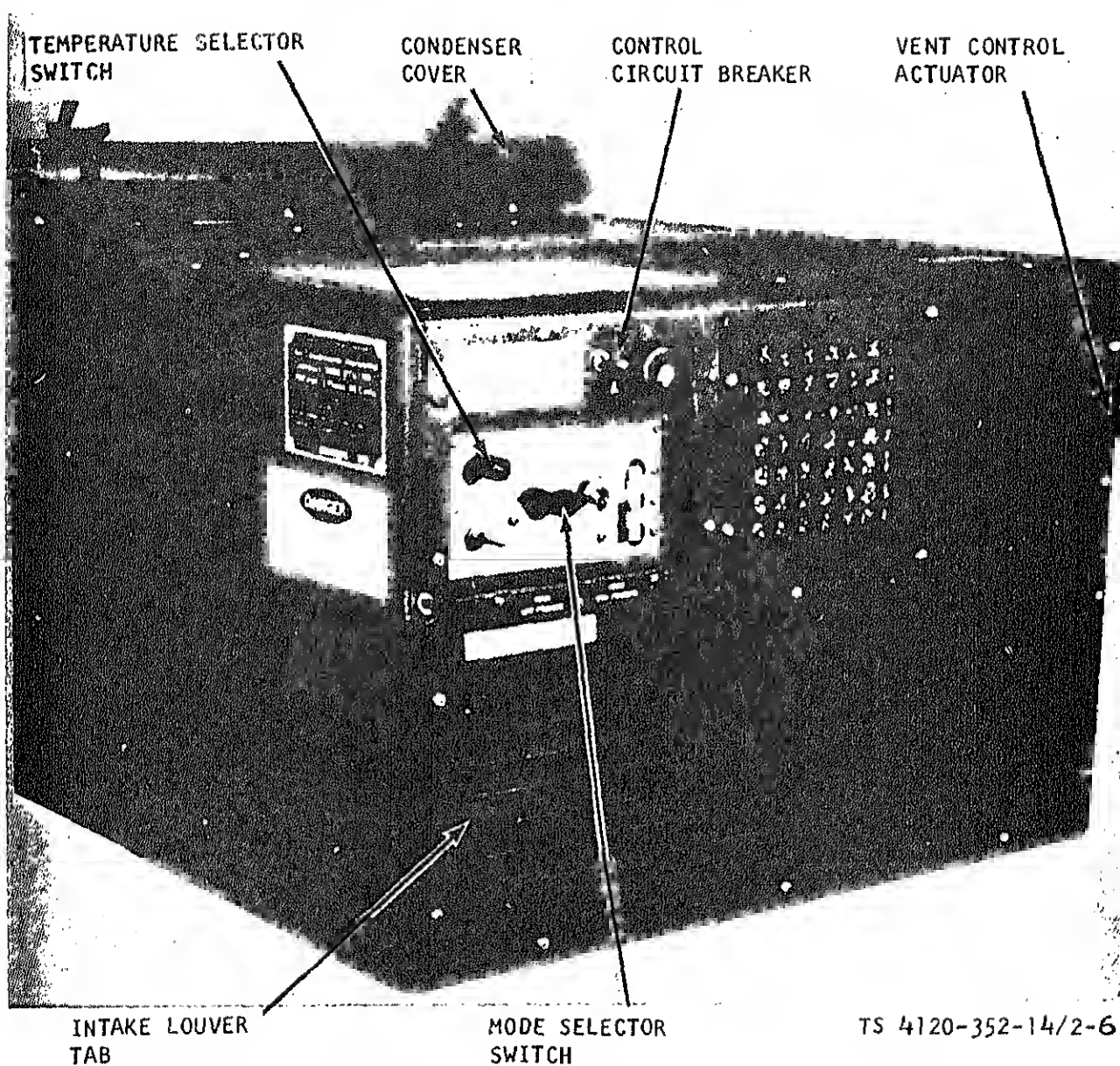


- STEP 1 BE SURE CONDENSER COVER IS ROLLED UP TS 4120-352-14/2-4
- STEP 2 LIFT TABS AND OPEN INTAKE LOUVERS
- STEP 3 TURN VENT CONTROL ACTUATOR TO CLOSE DAMPER DOOR
- STEP 4 TURN TEMPERATURE SELECTOR SWITCH TO FURTHEST CLOCKWISE POSITION (WARMER)
- STEP 5 TURN ON CONTROL CIRCUIT BREAKER
- STEP 6 TURN MODE SELECTOR SWITCH TO VENTILATE AND ALLOW FRESH AIR



TS 4120-352-14/2-5

- STEP 1 LEAVE MODE SELECTOR SWITCH ON COOL
- STEP 2 ADJUST TEMPERATURE SELECTOR SWITCH TO DEGREE OF COOLING DESIRED
- STEP 3 SET EVAPORATOR FAN SPEED SWITCH TO DESIRED POSITION



TEMPERATURE SELECTOR  
SWITCH

CONDENSER  
COVER

CONTROL  
CIRCUIT BREAKER

VENT CONTROL  
ACTUATOR

INTAKE LOUVER  
TAB

MODE SELECTOR  
SWITCH

TS 4120-352-14/2-6

- STEP 1 BE SURE CONDENSER COVER IS ROLLED UP
- STEP 2 LIFT TABS AND OPEN INTAKE LOUVERS
- STEP 3 TURN VENT CONTROL ACTUATOR TO CLOSE DAMPER DOOR
- STEP 4 TURN TEMPERATURE SELECTOR SWITCH TO  
FURTHEST COUNTERCLOCKWISE POSITION (COOLER)

CONDENSER COVER

TEMPERATURE SELECTOR  
SWITCH

CIRCUIT  
BREAKER

VENT CONTROL  
ACTUATOR

INTAKE LOUVER  
TAB

MODE SELECTOR  
SWITCH

NOTE: AFTER STARTING ADJUST  
TEMPERATURE SELECTOR SWITCH TO OBTAIN  
DESIRED ENCLOSURE TEMPERATURE

TS 4120-352-14/2-

- STEP 1 TURN VENT CONTROL ACTUATOR TO OPEN DAMPER DOOR
- STEP 2 PARTIALLY CLOSE INTAKE LOUVER BLADES
- STEP 3 TURN MODE SELECTOR SWITCH TO HIGH HEAT OR LOW HEAT
- STEP 4 ADJUST TEMPERATURE SELECTOR SWITCH TO  
DESIRED ENCLOSURE TEMPERATURE



TEMPERATURE SELECTOR  
SWITCH

CONDENSER COVER

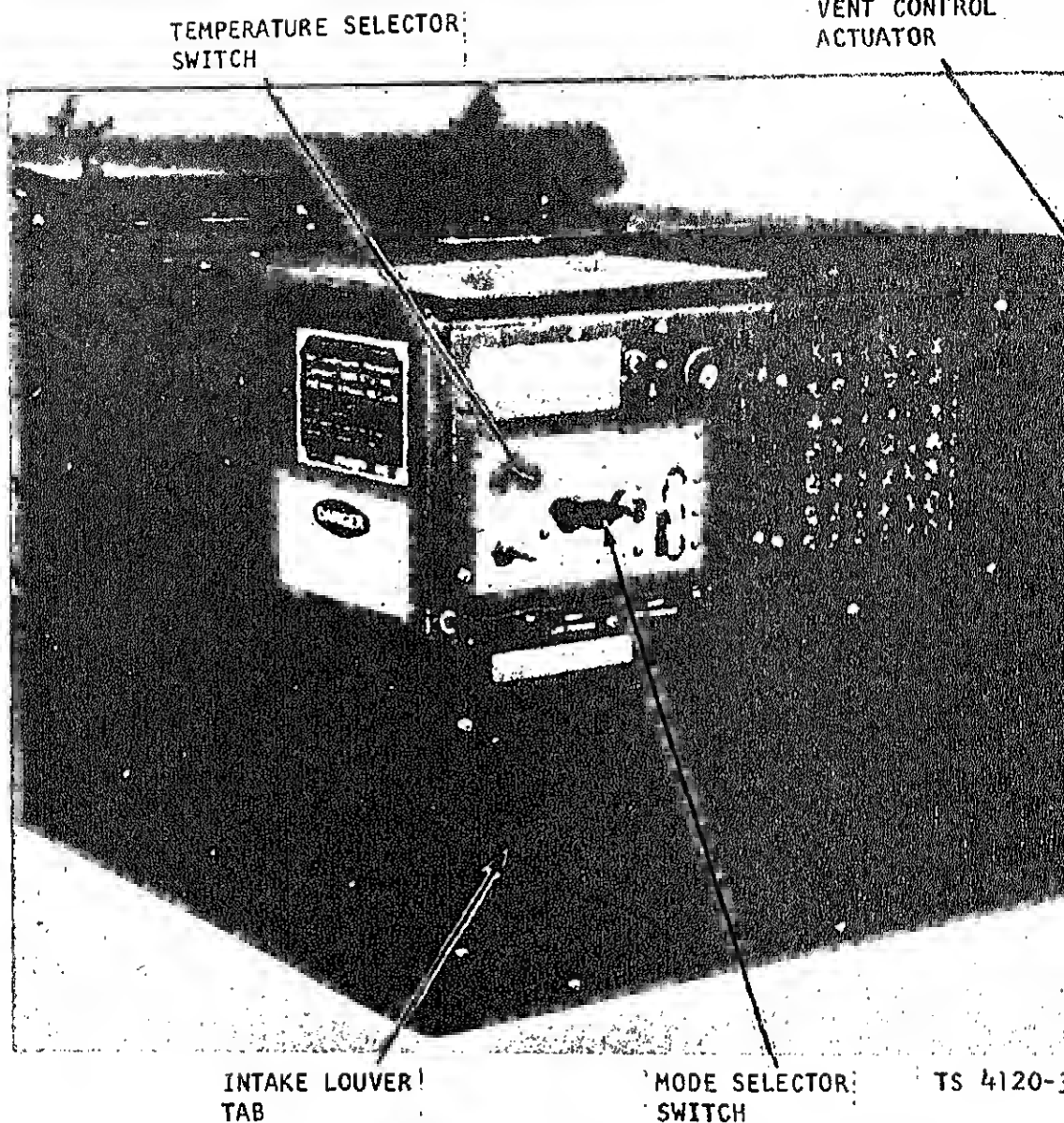
VENT CONTROL  
ACTUATOR

INTAKE LOUVER  
TAB

MODE SELECTOR SWITCH

TS 4120-352-14/2-

STEP 1 BE SURE CONDENSER COVER IS ROLLED UP



STEP 1 TURN MODE SELECTOR SWITCH TO OFF

STEP 2 CLOSE INTAKE LOUVERS

STEP 3 TURN ACTUATOR TO CLOSE FRESH AIR VENT DAMPER

NOTE: IF SHUTDOWN IS FOR AN EXTENDED PERIOD,

### 2-10. Operation in Extreme Cold

**a. General.** The air conditioner is designed to operate on the heating cycle in ambient temperatures as low as minus 50°F (-45°C) and on cooling cycle with 0°F (-18°C) air entering the condenser and 70°F (21°C) air entering the evaporator.

**b. Before Operation.** Before starting on cooling cycle be sure cover is removed from condenser air intake and discharge. Clear all ice and snow from openings. Be sure all dampers are in operating condition.

**c. After Operation.** Install cover over condenser air intake and discharge openings.

#### CAUTION

Do not disturb wiring during cold weather unless absolutely necessary. Cold temperatures make wiring and insulation brittle and easily broken.

### 2-11. Operation in Extreme Heat

**a. General.** The air conditioner is designed to operate satisfactorily at temperatures up to plus 120°F (49°C). If unit is operated at condenser inlet temperatures higher than 120°F (49°C), the cooling capacity will be lowered, and long periods of operation at extended temperatures may cause condenser or condenser fan motor to overheat and trip high internal overload switches or the high pressure cutout switch will shut the unit off.

**b. Filters.** To maintain the highest capacity of the unit, the return air filter and fresh air screen should be cleaned weekly or more often if necessary. Dirty filters reduce the flow of air across the evaporator coil, thereby reducing the capacity of the air conditioner.

**c. Guards and Louvers.** Keep all guards and louvers clean and free of any obstructions to maintain full air flow through the air conditioner.

**d. Coils.** Clean evaporator and condenser coils as frequently as necessary to prevent dirt or other matter from obstructing the air flow.

filters, coils, electrical components and grilles. Use compressed air, if available, to aid in cleaning.

#### **e. Air Filters and Coils.**

(1) Under extremely dusty or sandy conditions, the louvers, filters, coils, electrical components and grilles must be serviced more often.

#### NOTE

Never operate the unit without having the air filters in place.

(2) The condenser coil is subjected to ambient air. Therefore, it requires cleaning more often than the evaporator coil.

### 2-13. Operation Under Rainy or Humid Conditions

Take special precautions to keep equipment dry. If installed outdoors, cover the equipment with a waterproof cover when it is not in use. Remove cover during dry periods. Take all necessary precautions to keep the electrical components free from moisture.

#### WARNING

Make sure power is disconnected from air conditioner before touching any wiring or other electrical parts.

### 2-14. Operation in Salt Water Areas

**a. General.** Wash the exterior and condenser section of the unit, particularly condenser air discharge louver control mechanism, with clean fresh water at frequent intervals. Be careful not to damage electrical system with water. Special attention must be given to prevent rust and corrosion.

#### WARNING

Disconnect power source prior to washing the air conditioner.

# OPERATOR/CREW MAINTENANCE INSTRUCTIONS

## Section I. LUBRICATION INSTRUCTIONS

### 3-1. Fan Motors.

The evaporator and condenser motors are permanently lubricated by the manufacturer and require no additional lubrication.

### 3-2. Compressor.

The compressor and compressor motor are fully lubricated by the manufacturer and require no additional lubrication.

## Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

### 3-3. General.

To insure that the air conditioner is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraph 3-4. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction to be made as soon as operation of the unit has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were con-

tinued. All deficiencies and shortcomings will be recorded, together with the corrective action taken, on DA Form 2404, at the earliest possible opportunity.

### 3-4. Daily Preventive Maintenance Services.

This paragraph contains a tabulated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to table 3-1 for the daily preventive maintenance services.

*Table 3-1. Operator/Crew Preventive Maintenance Checks and Services*

*B - Before Operation                      D - During Operation                      A - After Operation*

INTERVAL AND SEQUENCE NO.			ITEM TO BE INSPECTED PROCEDURE	WORK TIME (M/H)
B	D	A		
1			CONDENSER COVER With cover rolled up for operation, check securing ties for damage.	0.05
2	4	7	DRAINS Inspect drains for obstruction to drainage. Remove obstructions	0.10
3			MAINT POWER RECEPTACLE CONNECTOR Check for secure power connection. Tighten if necessary	0.05
	5		LIQUID SIGHT INDICATOR Check for moisture and low refrigerant charge. Yellow indicates moisture; bubbles or milky appearance indicates low charge.	0.05

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
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# The Metric System and Equivalents

## Linear Measure

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 dekameter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3,280.8 feet

## Weight

1 centigram = 10 milligrams = .16 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = 15.4 ounces  
 1 dekagram = 10 grams = 35 ounces  
 1 hectogram = 10 dekagrams = 352 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 2.2 short tons

## Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce  
 1 decaliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 decaliters = 33.82 fl. ounces  
 1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

## Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch  
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches  
 1 sq. meter = 10,000 sq. centimeters = 10.76 sq. feet  
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 m.  
 1 sq. kilometer = 100 sq. hectometers = 386 sq. mile

## Cubic Measure

1 cu. centimeter = 1,000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1,000 cu. centimeters = 61.02 cu. inches  
 1 cu. meter = 1,000 cu. decimeters = 35.31 cu. feet

# Approximate Conversion Factors

To Change	To	Multiply by	To Change	To	Multiply by
inches	centimeters	2.540	ounce inches	newton meters	.007
feet	meters	.305	centimeters	inches	2.540
yards	meters	.914	meters	feet	3.281
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	6.452
square yards	square meters	8.36	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.357
pints	liters	.473	milliliters	fluid ounces	29.573
quarts	liters	.946	liters	pints	2.029
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	16.013
short tons	metric tons	.907	kilograms	pounds	2.205
long tons	metric tons	1.016	metric tons	short tons	.907



inlet louver (fig. 4-2). Slide return air filter from retaining clips on louver.

*c. Cleaning and Inspection.* Clean and inspect air filter as follows:

**WARNING**

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138° F (38° - 59° C).

(1) Wash filter in detergent and water solution or cleaning solvent (Fed. Spec. P-D-680). Dry thoroughly.

(2) Inspect filter for damage or clogged condition. Replace filter if damaged or clogged.

(3) Oil filter with SAE 30 oil. Drain eight hours and wipe off excess oil.

*d. Installation.* Slide filter into air inlet louver and secure louver to housing with eight screws and lockwashers.

*e. Mist Eliminator Removal.* Refer to figure 405 and remove the top front cover. Slide the mist eliminator (figure 4-2) from its holder.

*f. Cleaning and Inspection.* Clean and inspect the mist eliminator as follows:

**WARNING**

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138° F (38° - 59° C).

(1) Wash in detergent and water solution or cleaning solvent (Fed. Spec. P-D-680). Dry thoroughly.

(2) Inspect for damaged or clogged condition. Replace if damaged or if clogged condition is not corrected by cleaning.

cover.

## 4-18. Evaporator Air Inlet Louvers.

*a. General.* The evaporator air inlet damper is adjustable to control the amount of air that will pass through the air conditioning unit. The air ventilation damper is open. The air outlet louver, mounted in front of the condenser coil, has individually adjustable blades to control evaporator air outlet flow.

*b. Removal.* Refer to figure 4-18 for removal of eight screws and lockwashers, and removal of evaporator air inlet louver. Remove the air outlet filter by removing six screws and lockwashers.

*c. Cleaning, Inspection and Repair.* Clean, inspect and repair louvers as follows:

**WARNING**

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138° F (38° - 59° C).

(1) Clean louvers with cleaning solvent (Fed. Spec. P-D-680).

(2) Inspect for bent or broken blades. Straighten bent blades. Replace broken blades.

*d. Installation.* Refer to figure 4-18 for installation of the air inlet louver, using eight screws and lockwashers. Install outlet louver over the condenser coil, using six screws and lockwashers.

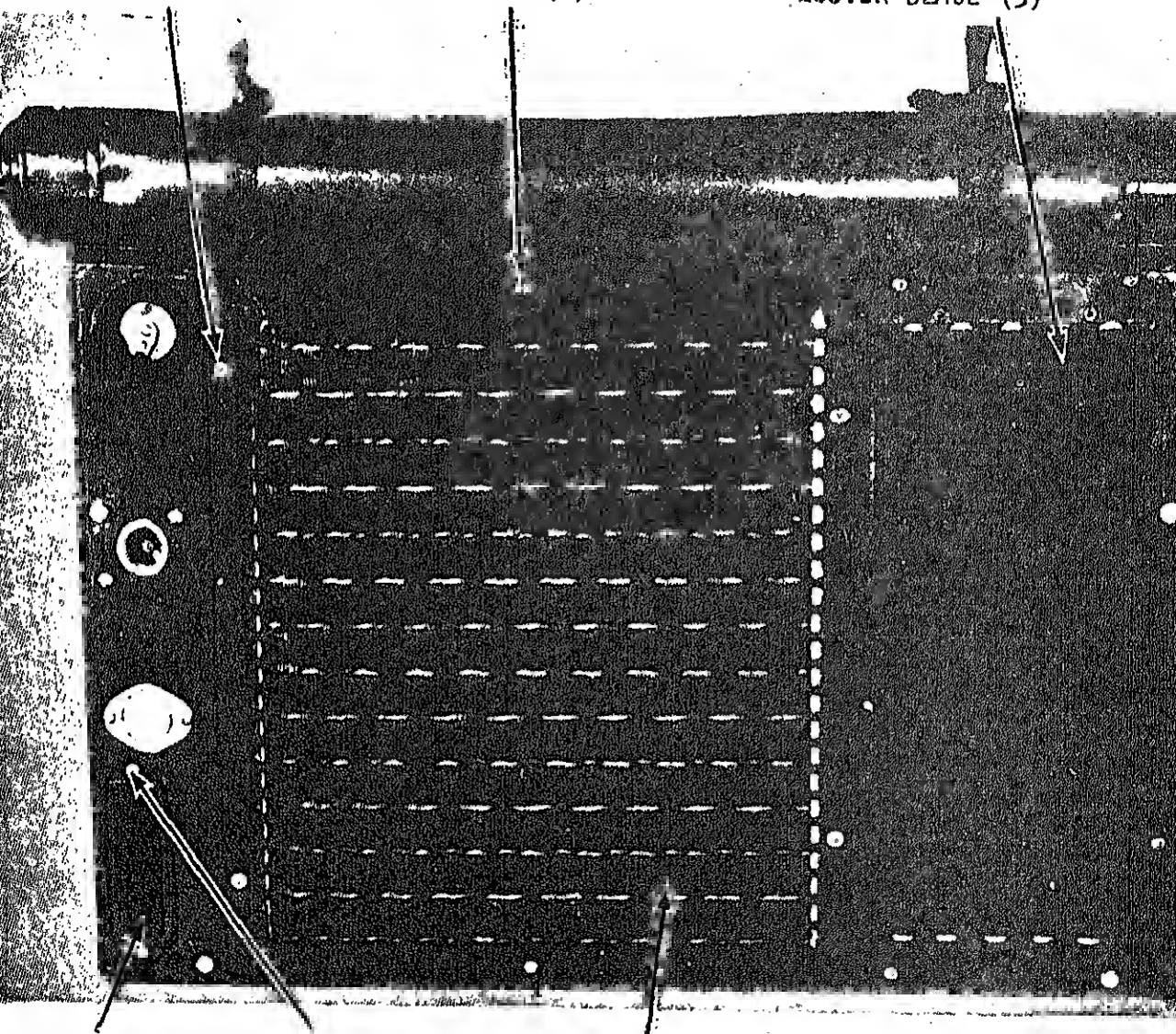
## 4-19. Fresh Air Screen.

*a. General.* The fresh air screen is mounted on the rear wall of the housing to prevent bug and dirt borne matter from entering the unit. This unit is designed for use with

SCREW AND  
LOCKWASHER (4)

SCREW AND  
LOCKWASHER (2)

CONDENSER  
LOUVER BLADE (5)



FRESH AIR  
INTENT SCREEN

SCREW AND  
LOCKWASHER (2)

CONDENSER  
GUARD

TS 412D-352-14/4-3

screws and lock washers and fresh air screen.

### **WARNING**

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138° F (38° - 59° C).

*c. Cleaning and Inspection.* Clean the screen in cleaning solvent (Fed. Spec. P-D-680). Replace the screen if damaged or broken.

*d. Installation.* Refer to figure 4-3 and install the screen and two screws and lockwashers.

## **4-20 Condenser Guard and Louver.**

*a. General.* The condenser guard (fig. 4-3), located at the rear of the air conditioner, is an expanded metal guard that protects the condenser coil from damage. The condenser air discharge louver is opened and closed automatically by an actuator cylinder in the refrigeration system. A push-pull control assembly connects the louver and cylinder.

*b. Cleaning and Inspection.* The guard can be cleaned with a bristle brush without removing the

guard from the air conditioner or the guard removed and washed thoroughly. Clean the with a dry cloth. Inspect louver blades for bent or broken rubber strips. Inspect guard for bent or broken condition.

*c. Condenser Guard Removal and Installation.* Refer to figure 4-3 and remove and install condenser guard as follows:

(1) Remove two screws and lockwashers from top and bottom of guard.

(2) Remove four screws and lockwashers securing guard to condenser coil. Remove guard.

(3) Install guard and six screws and lockwashers previously removed.

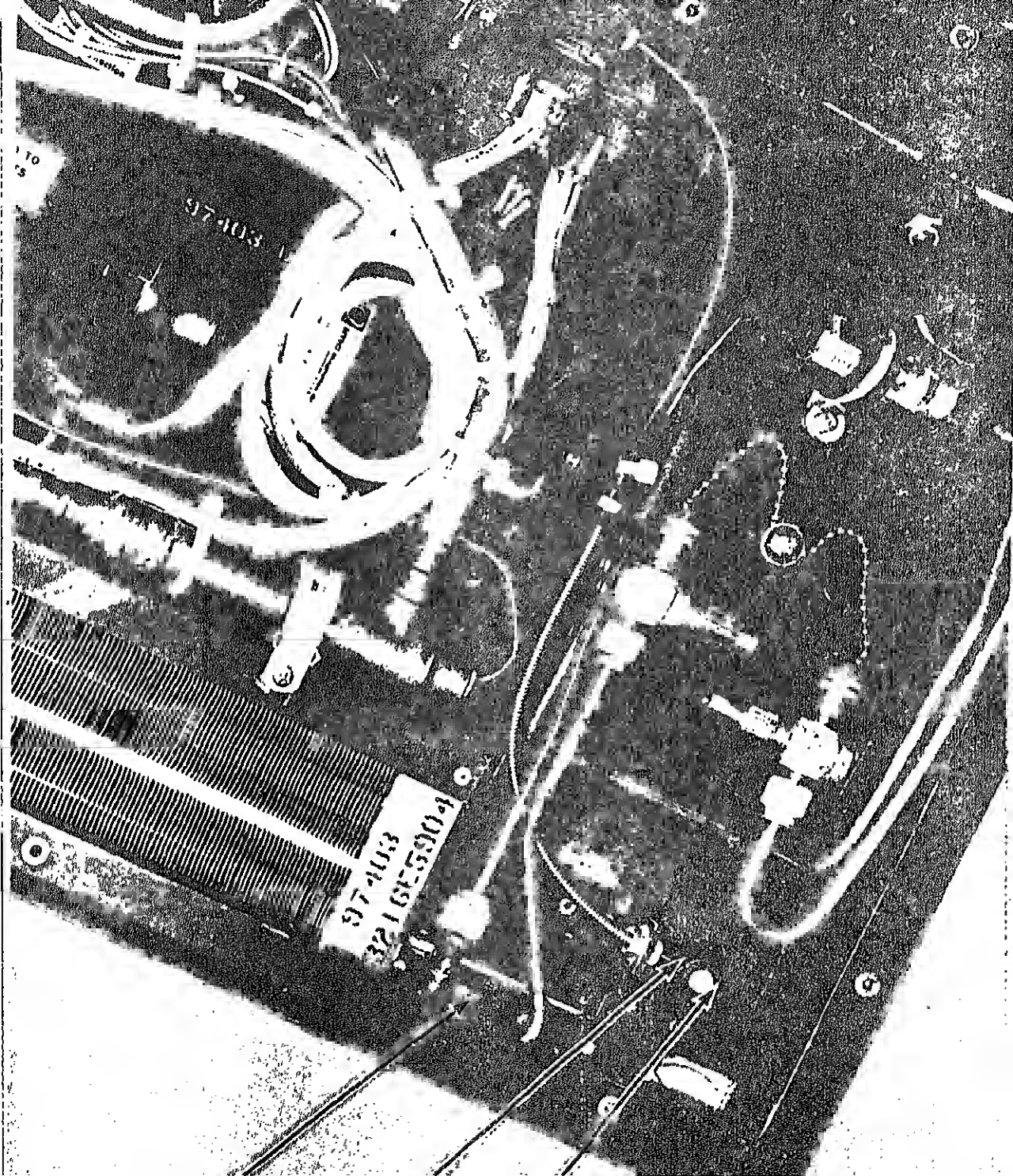
*d. Replacement of Louver Blades.* Indent condenser louver blades (fig. 4-3) are flexible enough for removal. Remove damaged blades as follows:

(1) Remove rear cover as described in paragraph 4-21.

(2) Remove push-on type nut (fig. 4-4) from louver blades to be removed. Flex blade to remove ends from bearings and remove blade.

(3) Flex new blade in same manner as in removal and install ends in bearings.

(4) Install push-on nut.



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**c. Condenser Louver Control Adjustment.** To adjust the louver control with refrigerant in the system, proceed as follows:

(1) Turn off air conditioner and wait four hours or until air conditioner is uniformly at ambient temperature.

(2) Loosen mechanical post screw (fig. 4-4). Close condenser louvers, pull wire tight and tighten mechanical post screw. Louvers must be tightly closed when air conditioner is off.

#### **4-21. Housing Covers.**

**a. General.** The top of the housing is enclosed by front, center and rear covers. The rear cover has an access opening over the charging valves. This

opening is covered by an access cover in normal operation. A canvas cover, mounted on the rear cover, is used to cover the condenser and access opening when the air conditioner is not in operation.

##### **b. Removal.**

(1) To remove front cover, remove front cover screws (fig. 4-5) and remove front cover.

(2) To remove access cover (fig. 4-6), remove four screws and remove cover.

(3) To remove rear cover (fig. 4-7), remove three screws and lockwashers and remove rear condenser cover. Remove seven screws and remove cover.

(4) The front and rear covers must be removed before removing the center cover (fig. 4-8). Remove six screws. Remove two screws securing static switch bracket to cover.

CENTER  
COVER

FRONT  
COVER  
SCREW (8)

clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138° F (38° - 59° C).

(1) Brush off any loose dirt or foreign matter from gaskets and insulation. Wipe off tops of metal parts with a cloth dipped in cleaning solvent (Fed. Spec. P-D-680). Wash dirt from condenser cover.

(2) Inspect metal covers for distortion and

replace loose or damaged gaskets. Replace cover if it will not form a seal after repair.

(4) Replace condenser cover if damaged.  
*d. Installation.* Refer to figure 4-4 for cover as follows:

(1) Install thermostatic switch cover and secure with two screws.

(2) Install rear cover and secure with three screws and three screws at condenser cover and three screws at fan compartment.

(3) Install access cover and secure with two screws.

(4) Install front cover and secure with two screws.

## Section IX. MAINTENANCE OF CONDENSER COIL, EVAPORATOR COIL, AND DRAINS

### 4-22. General.

The condenser coil (fig. 1-3) and evaporator coil require periodic cleaning to insure full air flow through the coils and maximum heat transfer during operation. The evaporator drain tubes (fig. 4-6), located under the evaporator coil in the evaporator fan compartment, are connected to a drain tube in the housing. The housing drain tube terminates in the drain openings at the rear of the housing. Drain tubes must be open to prevent buildup of condensate under the evaporator coil.

### 4-23. Servicing Condenser Coil.

*a.* Refer to figure 4-5 and remove rear cover and condenser cover.

*b.* Clean the surface of the condenser coil with a soft bristle brush. Blow dirt out from between the fins with compressed air. Hold nozzle of air hose at least 6 to 8 inches away from coil to avoid damaging the fins.

#### WARNING

Compressed air is not to exceed 15 psi.  
Do not use steam to clean coils.

*c.* During cleaning inspect coil for leaks or damaged fins. If leaks or damage are evident, report condition to direct support maintenance.

*d.* Refer to figure 4-5 and install rear cover and condenser cover.

### 4-24. Servicing Evaporator Coil.

*a.* Refer to paragraph 4-17 and remove evaporator outlet louver and mist eliminator. Refer to figure 4-5 and remove front cover.

*b.* Clean the surface of the evaporator coil with a soft bristle brush. Blow dirt out from between the fins with compressed air. Hold nozzle of air hose at least 6 to 8 inches away from coil to avoid damaging the fins.

#### WARNING

Compressed air is not to exceed 15 psi.  
Do not use steam to clean coils.

*c.* During cleaning, inspect coil for leaks or damaged fins. If leaks or damage are evident, report condition to direct support maintenance.

*d.* Refer to paragraph 4-18 and install evaporator outlet louver. Refer to paragraph 4-21 and install evaporator cover.

### 4-25. Evaporator Drain Tubes.

*a. Removal.* Refer to figure 4-6 and remove evaporator drain hose clamps, tee, and three pieces of flexible drain tubing.

*b. Cleaning and Inspection.* Clean evaporator drain tubing as follows:

(1) Flush out tubing and clean out accumulation of dirt or other foreign matter. Use a small diameter brush or a piece of



18. (2) Connect tubing to drain connections with hose clamps.

Installation. Refer to figure 4-6 and install drain tubing as follows:

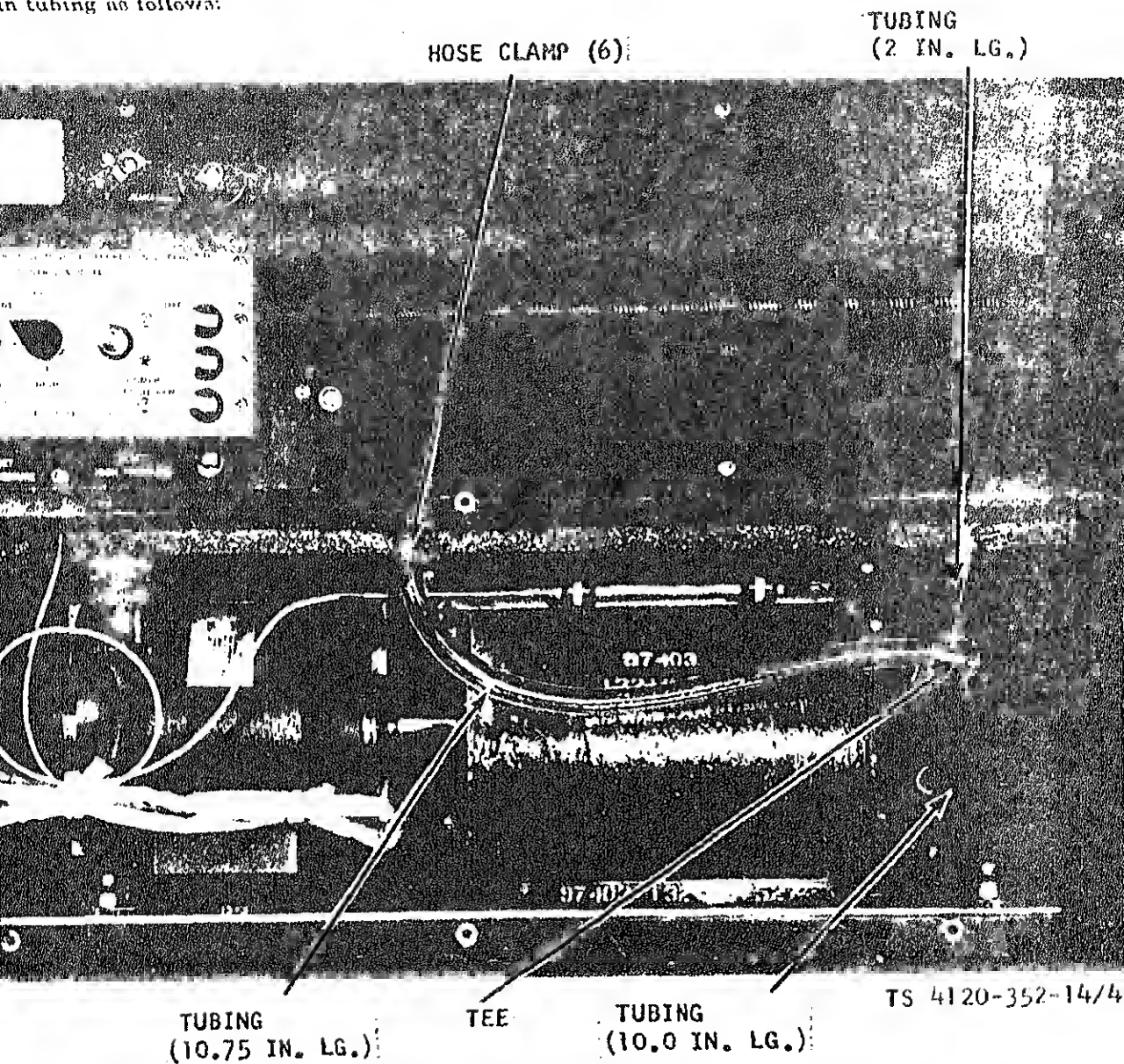


Figure 4-6. Evaporator drain tubing.

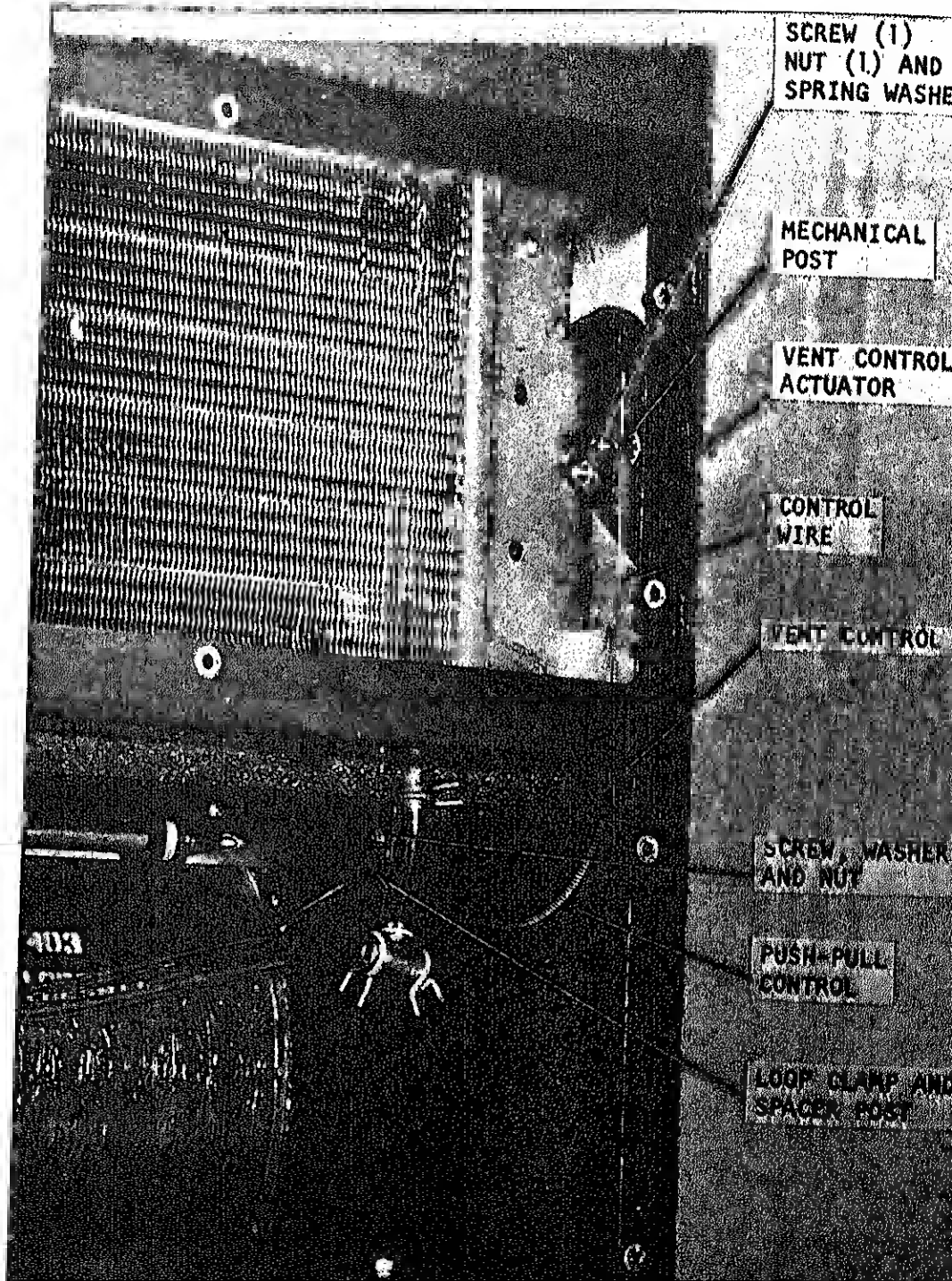
## Section X. MAINTENANCE OF FRESH AIR VENT DAMPER AND CONTROL

4-26. General.

4-27. Adjustment.



...on the mechanical post, set the actuator or  
damper rod, and tighten the screw.



SCREW (1)  
NUT (1) AND  
SPRING WASHER

MECHANICAL  
POST

VENT CONTROL  
ACTUATOR

CONTROL  
WIRE

VENT CONTROL

SCREW, WASHER  
AND NUT

PUSH-PULL  
CONTROL

LOOP CLAMP AND  
SPACER POST

VENT DAMPER

MECHANICAL  
POST SCREW

CONTROL WIRE  
CORE

PUSH-PULL  
CONTROL

NUT

ROTATION

ARGED

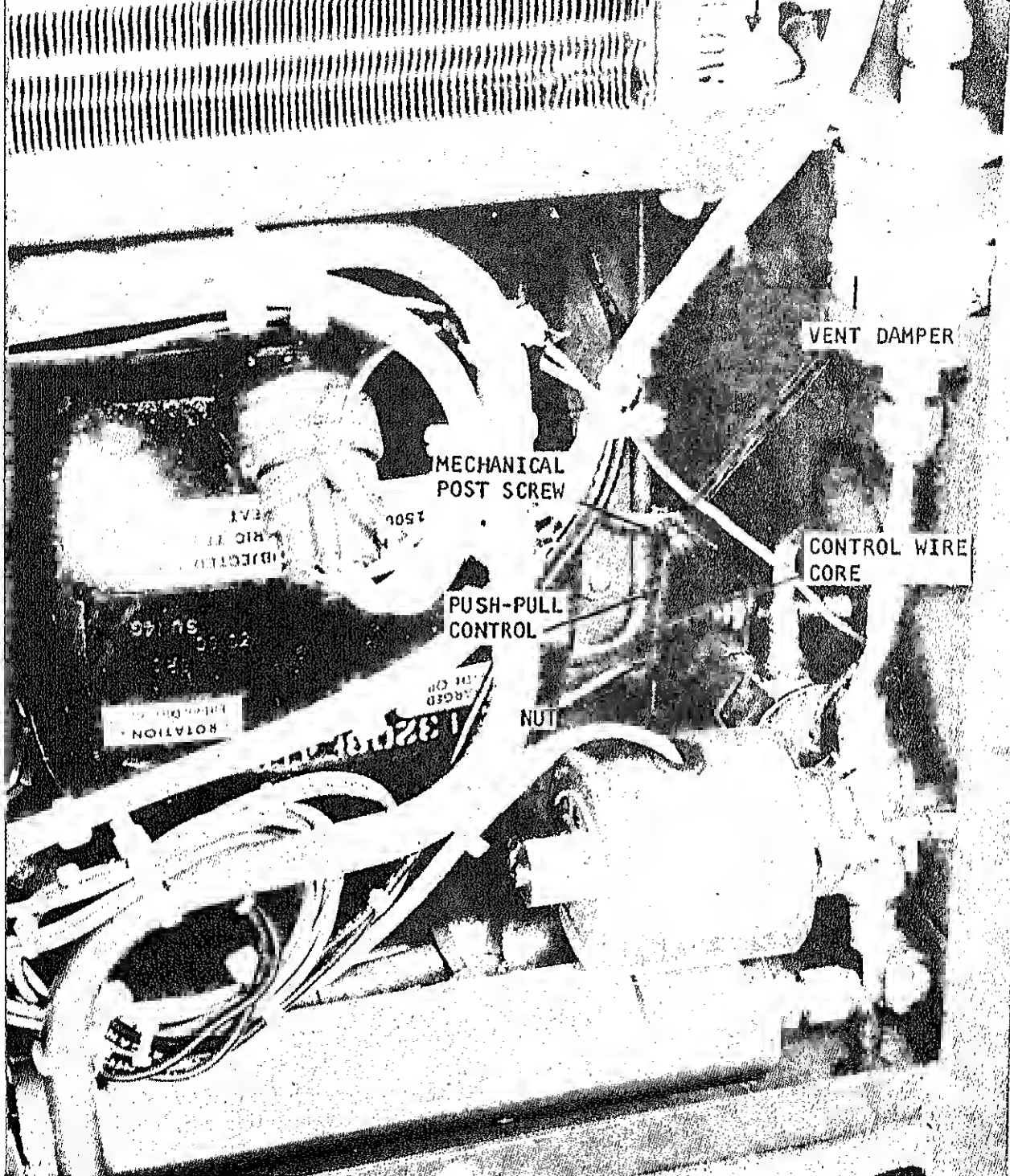
20 30 40

1500

RECEIVED

RIC 11

1701



On top of the damper should be parallel with front of the housing.

c. Check operation. The control should move smoothly between the open and closed position.

#### 4-28. Removal.

a. *Vent Damper.* Refer to figure 4-5 and remove the housing covers. Refer to figure 4-8 and remove vent damper as follows:

(1) Loosen screw on mechanical post and disconnect push-pull control.

(2) Remove two screws and lockwashers and lift vent damper from air conditioner.

b. *Push-Pull Control.* Refer to figure 4-2 and remove evaporator louvers. Refer to figures 4-7 and 4-8 and remove push-pull control as follows:

(1) Remove screw, washer, nut, spacer, and loop clamp.

(2) Loosen screw on mechanical post to free end of control wire core.

(3) Remove outer nuts from both ends of control outer casing and remove push-pull control.

c. *Vent Control Actuator.* Refer to figure 4-7 and remove screw, nut, two spring washers and actuator.

#### 29. Cleaning, Inspection and Repair.

Clean, inspect and repair vent damper and control as follows:

ation of core in casing. Inspect vent damper for or broken condition. Replace defective part. Inspect for loose or damaged rubber seal on damper. Cement loose rubber or replace rubber if damaged. Inspect actuator for bent condition. Straighten actuator or replace as required.

#### 4-30. Installation.

a. *Vent Control Actuator.* Refer to figure 4-7 and install actuator, screw, two spring washers and nut.

b. *Vent Damper.* Refer to figure 4-8 and install vent damper in opening in housing. Secure damper cover to housing with two screws and washers.

c. *Push-Pull Control.* Refer to figure 4-7 and 4-8 and install control as follows:

(1) With one nut on each end of outer casing of push-pull control, install ends of control through opening in housing. Install outer nuts and insert ends of wire core into mechanical post of damper and actuator. Tighten outer nuts on casing.

(2) Install clamp, spacer, screw, nut, and washer.

(3) Refer to paragraph 4-27 and adjust control.

(4) Refer to figure 4-5 and install housing covers.

(5) Refer to figure 4-2 and install evaporator inlet and outlet louvers.

### Section XI. MAINTENANCE OF ELECTRICAL SYSTEM

#### 31. General.

The electrical system consists of the evaporator and condenser fan motors, electric heaters and thermostat, thermostatic switch, junction box, control module, transformer, rectifier, condenser fan motor, high-low speed thermostatic switch and connecting wires and wiring. Electrical assemblies and groups of associated components are covered in separate sections.

#### WARNING

Disconnect air conditioner power supply before performing maintenance work on electrical system.

#### 4-32. Testing and Inspecting the Electrical System.

Troubleshooting procedures for testing the electrical system to isolate cause of trouble are covered in paragraph 4-12. Additional detailed test information is contained in specific paragraphs covering the electrical components. Use a continuity tester or multimeter set on low ohms to test for continuity. Use an insulation tester or multimeter set on higher ohm range to test for grounds between the circuit in a component and the outside case of the component. When testing an electrical component check also for visual damage and insulation.

### 33. Wiring Harnesses and Leads.

*a. General.* The electrical circuits in the air conditioner are completed either by individual wire leads or by wire leads laced or enclosed in a loom to form a wiring harness. All of the wiring carries code numbers. When testing, repairing or replacing the wiring harness or individual wires, refer to the wiring diagram (1-5) and schematic diagram (1-4).

*b. Inspection.* Inspect all wiring installation for cracked or frayed insulation material. Pay particular attention to wires passing through holes in frame or around sharp edges. Repair or replace defective wiring. Inspect electrical connectors and fittings for damage or broken condition. Replace defective connectors and fittings.

*c. Testing.* Test for continuity in leads or wiring harnesses by disconnecting each end. Where wires

terminate in an electrical connector, disconnect the connector from corresponding receptacle connector or plug connector. Touch the test probes of a continuity tester, or multimeter set on low ohms, to each end of wire or corresponding pin of connector. If continuity is not indicated, repair or replace wire.

*d. Repair.* Remove insulation to expose 1/2 inch of bare wire on each side of break. Twist the wire ends and solder the splice. Cover the splice with PVC electrical tape, making certain to cover all of the repaired area. Replace broken terminal lugs with exact duplicates. To replace electrical connectors, unsolder wire from solder wells to inserts. Insert new connector and insert ends of wires in corresponding solder wells. Solder wires in place. Check connections carefully. Refer to wiring diagrams.

## Section XII. MAINTENANCE OF HEATERS AND THERMOSTATIC SWITCHES

### 34. Heater Thermostatic Switch.

*a. General.* The heater thermostatic switch, mounted in a bracket under the housing center cover, protects the air conditioner from overheating if the heating element circuit is actuated and the air flow is restricted or stopped.

*b. Removal.* Remove the switch as follows:

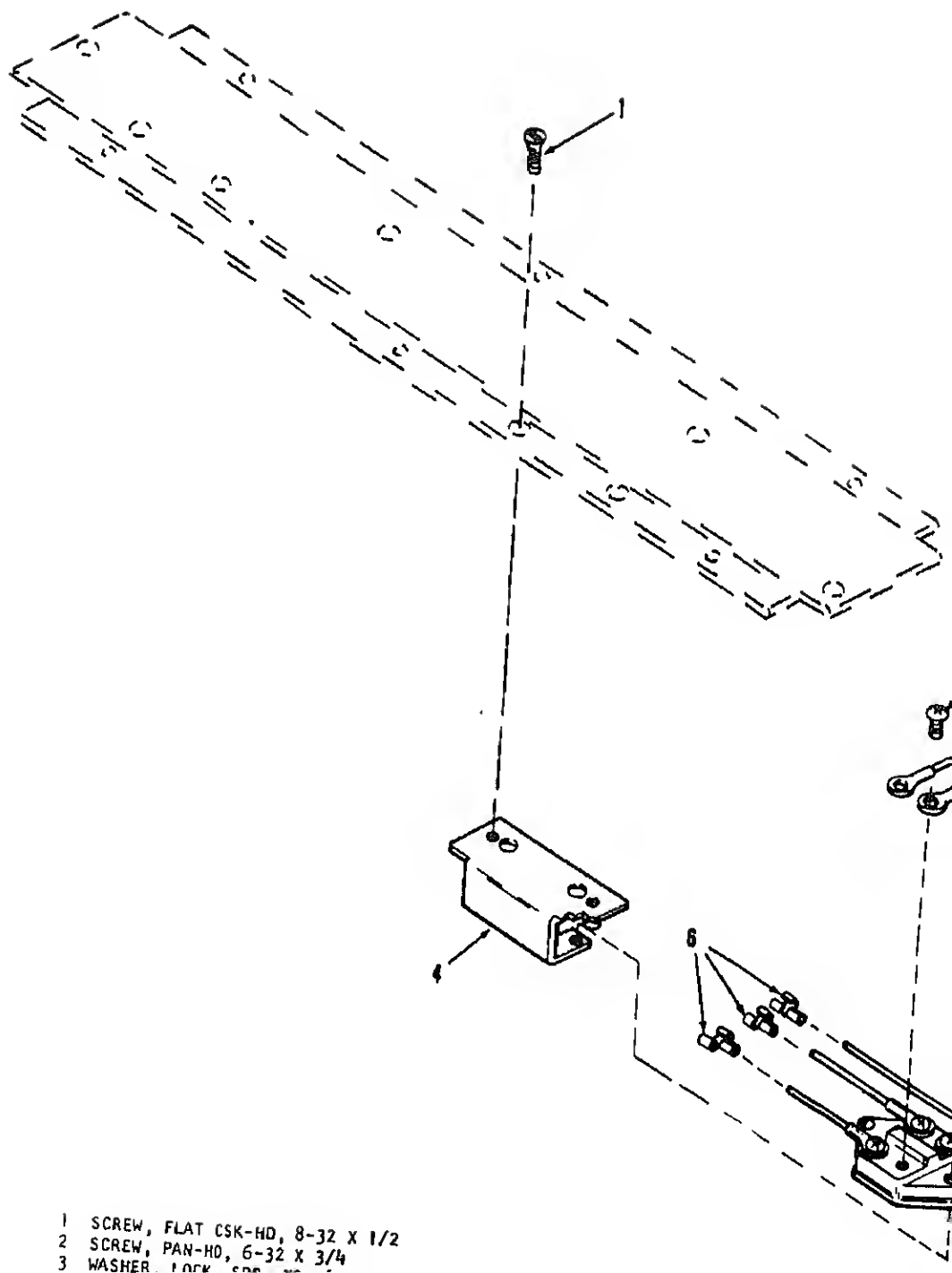
- (1) Refer to figure 4-5 and remove housing

front cover.

- (2) Refer to figure 4-9 and remove two screws (1) to remove bracket and switch from center cover.

- (3) Remove two screws (2) and lockwashers (3) and remove bracket (4).

- (4) Remove switch screws (5) and disconnect leads (6) from thermostatic switch (7).



- 1 SCREW, FLAT CSK-HD, 8-32 X 1/2
- 2 SCREW, PAN-HD, 6-32 X 3/4
- 3 WASHER, LOCK, 6-32 X 3/4

**c. Cleaning and Inspection.** Wipe off any accumulation of dust and test as described below.

(1) Test for continuity between contacts 1 and 2 and also between contacts 3 and 4. Contacts should open on temperature rise at  $150\text{ F} + 5^{\circ}$  ( $65.5\text{ C} + 2.25^{\circ}$ ) and close on temperature drop at  $110\text{ F} + 10^{\circ}$  ( $43\text{ C} + 5.5^{\circ}$ ).

(2) Replace switch if it fails to meet test requirements.

**d. Installation.** Refer to figure 4-9 and install heater thermostatic switch.

(1) Refer to wiring diagram and connect leads (6) to switch (7) with screw (5).

(2) Attach switch to bracket (4) with screws (2) and lockwashers (3).

(3) Secure bracket to center cover with two screws (1).

(4) Refer to figure 4-5 and install housing front cover.

## 4-35. Heater Elements.

**a. General.** The air conditioner is equipped with six heating elements, two across each phase. One element in each phase is switched out for low temperature. A thermostatic switch cycles off and on to provide temperature control.

**b. Removal.** Refer to figure 4-10 and remove heater elements as follows:

(1) Refer to figure 4-5 and remove housing cover.

(2) Disconnect leads from heaters.

(3) Remove two screws, washers, and lockwashers that secure heater support to housing. Remove support from ends of heater elements.

(4) Remove heater element nut, lockwasher, and flat washer from each heater in turn, and remove heater from bracket.

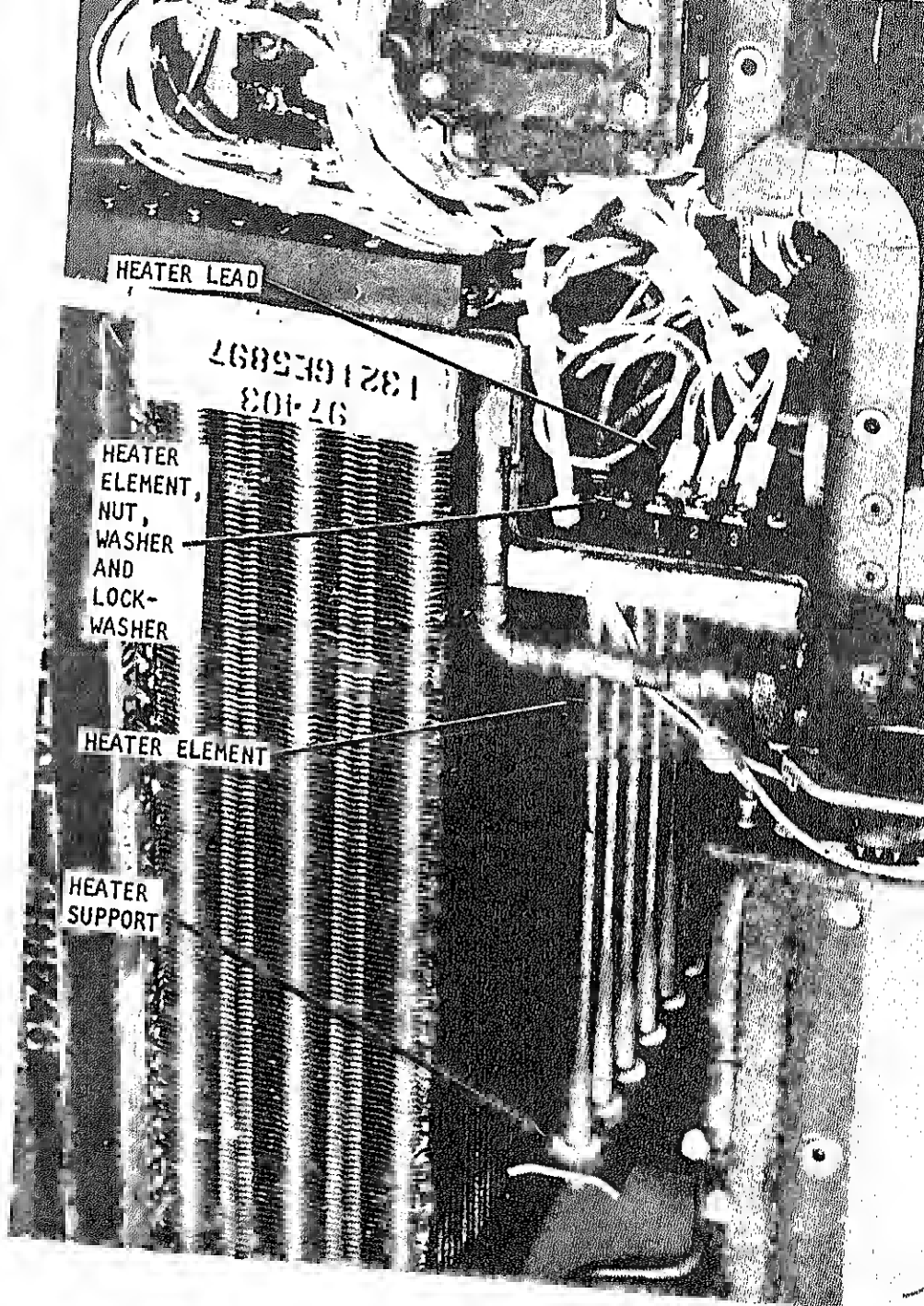
HEATER LEAD

2689391281  
808-26

HEATER  
ELEMENT,  
NUT,  
WASHER  
AND  
LOCK-  
WASHER

HEATER ELEMENT

HEATER  
SUPPORT



*c. Cleaning and Inspection.* Wipe off all accumulated dirt from heater elements and inspect for visible damage to element or leads. Check each heater element for continuity. Replace defective heaters. Repair damaged leads.

*d. Installation.* Refer to figure 4-10 and install heater elements as follows:

(1) Insert heaters in bracket and support with an insulating washer between bracket and flange of

each heater element.

(2) Install washer, lock washer, and screw on each heater element. Secure support with screws, washers, and lockwashers.

(3) Refer to wiring diagram and connect wires from terminals to heaters.

(4) Refer to figure 4-5 and install heater element covers.

## Section XIII. MAINTENANCE OF FAN MOTORS

### 4-36. General.

The evaporator fan and condenser fan motors are identical. The evaporator fan and motor are mounted on a common base in the lower front compartment of the air conditioner. The condenser fan motor is mounted on a separate base in the rear compartment of the air conditioner.

### 4-37. On-Equipment Testing.

*a.* Disconnect motor lead electrical connector.

*b.* Use a multimeter and test for continuity across each combination of two motor terminals. If continuity is not indicated, the windings are open and the motor should be replaced.

*c.* Place one multimeter probe against the fan motor housing and the other against one of the terminals. If continuity is indicated, the motor is grounded.

*d.* Replace motor if open or grounded.

#### NOTE

There are separate circuits through the fan motor protectors on high and low speed circuits; test for continuity across terminals in the same manner. Refer to wiring diagram.

### 4-38. Fan Motors.

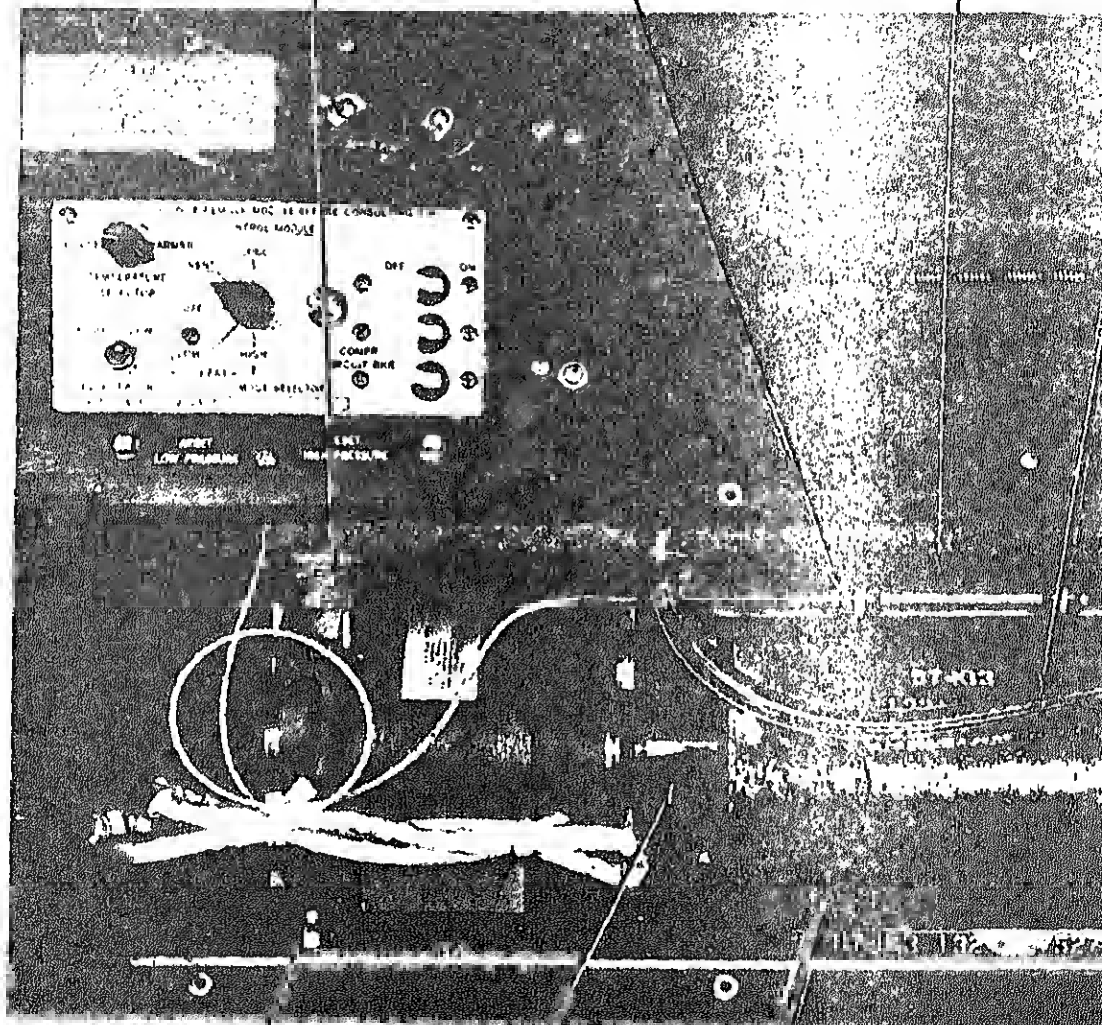
*a. Evaporator Fan Motor.* Refer to figure 4-10 and remove evaporator fan motor as follows:



ELECTRICAL  
CONNECTOR

TEMPERATURE  
SELECTOR SWITCH  
BULB CLAMP (2)

BRACKET



SCREW AND  
LOCKWASHER (4)

FAN AND  
MOTOR SHAFT

FAN AND  
MOTOR ASSEMBLY

TS 4120

(1) Refer to figure 4-2 and remove evaporator air inlet louver.

(2) Disconnect motor electrical connector.

(3) Refer to figure 4-6 and disconnect evaporator drain tubing.

(4) Remove three brackets above fan to facilitate removal of fan and motor assembly. Remove two screws, lockwashers and clamps. Move temperature selector bulb clear of fan.

(5) Remove four screws and lockwashers securing fan and motor base to resilient mounts and remove fan and motor assembly.

(6) To remove motor from the assembly, remove four cap screws and lockwashers from under-

side of base. Loosen setscrew in fan and motor and remove motor.

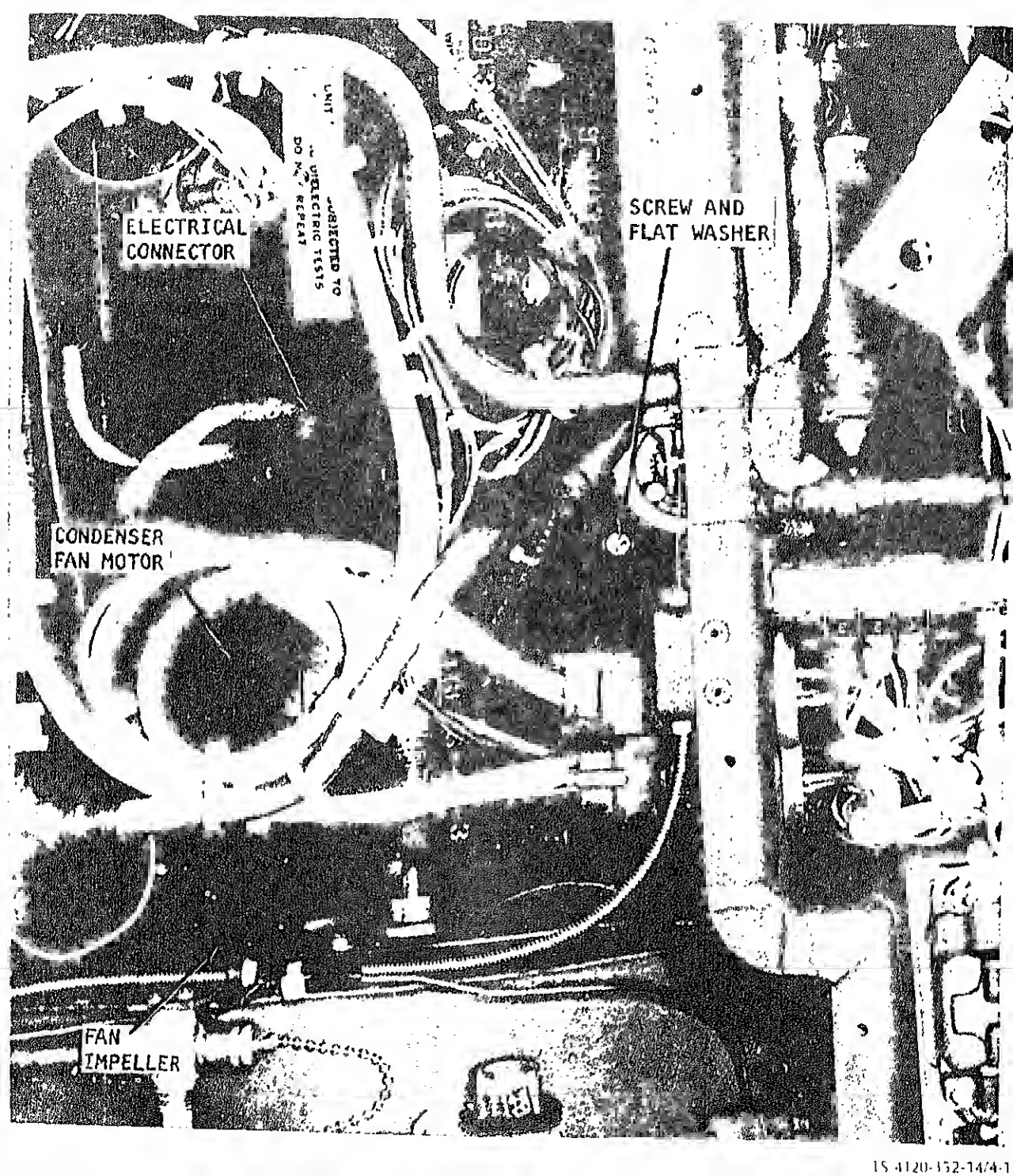
**b. Condenser Fan Motor.** Remove condenser fan motor as follows:

(1) Refer to figure 4-5 and remove hood covers.

(2) Refer to figure 4-12 and remove screws and flat washers that secure motor mounting plate to housing.

(3) Disconnect motor lead electrical connector. Remove wire tie as required.

(4) Loosen setscrew in hub of fan impeller and remove impeller from shaft of motor.



ELECTRICAL  
CONNECTOR

INJECTED TO  
UNIT  
DIRECTOR TESTS  
DO NOT REPEAT

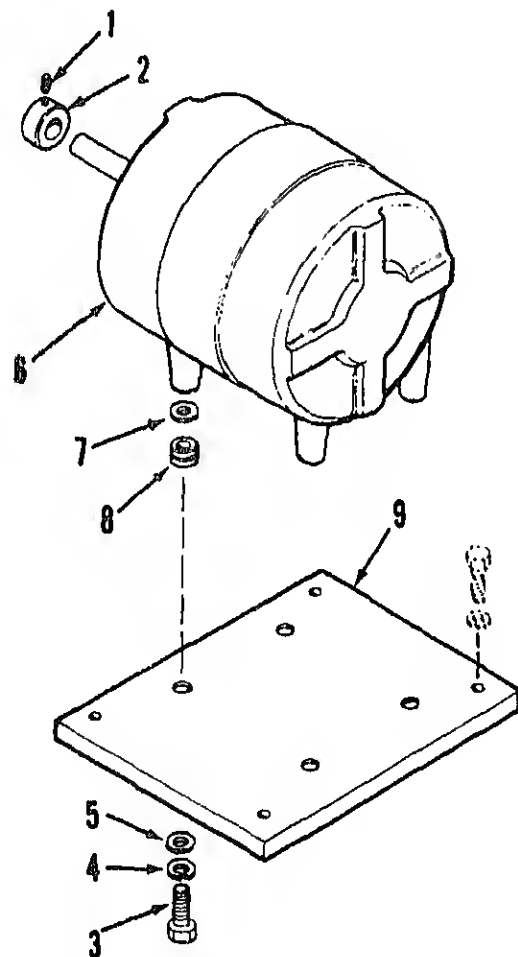
SCREW AND  
FLAT WASHER

CONDENSER  
FAN MOTOR

FAN  
IMPELLER

(5) Remove motor and mounting plate from conditioner.

(6) Refer to figure 4-13 and remove setscrew (2) from motor shaft. Remove four cap screws (3), lockwashers (4) and flat washers (5). Remove motor (6) and four flat washers (7) from mounting plate (9). Remove bushings (8) from plate if they require replacement.



TS 4120-352-14/4-13

### *c. Fan Motor Thermal Protector. Replacement.*

(1) General. Organizational repair of motor is limited to testing and replacement of defective thermal protectors. Instructions contained in this paragraph cover replacement of the motor thermal protectors.

(2) Removal. Refer to figure 4-14 and partially remove thermal protector housing from motor by removing two screws and washers. Tag and disconnect electrical leads. Remove thermal protector. Remove other protector in the same manner.

(3) Testing. Check for continuity between terminals. Replace protector if open.

(4) Installation. Install thermal protector in housing and connect leads. Install thermal protector housing on motor and secure with screws and washers previously removed.

1. Setscrew, 1/4-28 x 1/4

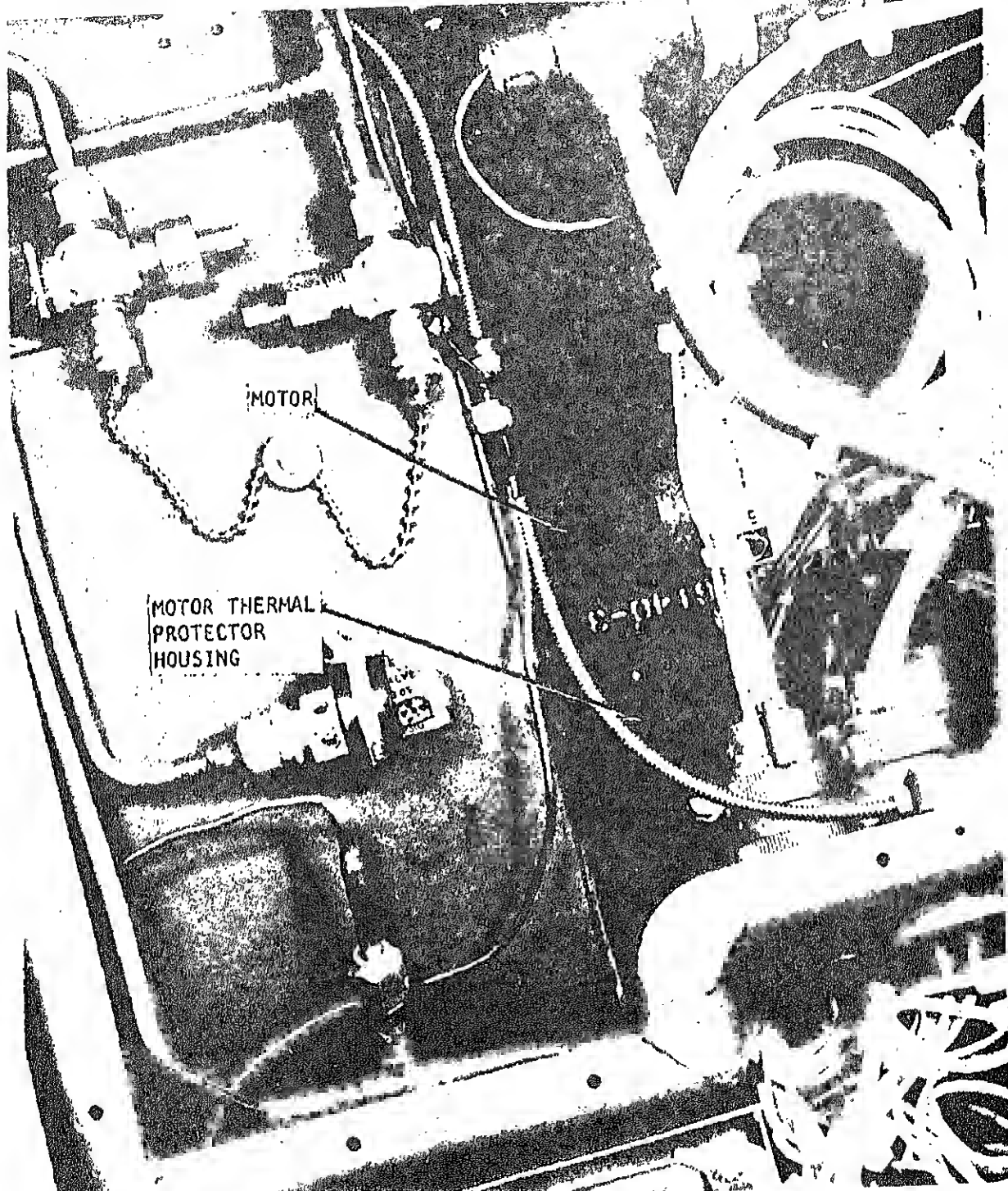
2. Collar

3. Screw, cap, hex-hd, 1/4-28 x 1"

MOTOR

MOTOR THERMAL  
PROTECTOR  
HOUSING

8-06-19



#### **d. Installation.**

(1) **Evaporator Fan Motor.** Install evaporator fan motor as follows:

(a) Set motor on fan-and-motor base with motor base in fan-and-motor shaft (fig. 4-11). Install four cap screws and lockwashers through underside of base to secure motor. Tighten setscrew in fan-and-motor shaft.

(b) Install fan and motor assembly on resilient mounts and install four screws and lockwashers (fig. 4-11).

(c) Install brackets above fan. Install temperature selector switch bulk in clamps and secure clamps with screws and lockwashers.

(d) Refer to figure 4-6 and install evaporator drain piping.

(e) Connect motor electrical connector.

(f) Refer to figure 4-2 and install evaporator air inlet louver.

**e. Condenser Fan Motor.** Assemble motor mounting plate and install motor and mounting plate as follows:

(1) Refer to figure 4-13 and install bushings (8) in mounting plate (9) if they were removed.

(2) Place a washer (7) over each bushing and set motor (6) on washers. Install four screws, washers (5), and lockwashers (4). Install collar on motor shaft and install setscrew (1).

(3) Install plate and motor in air conditioner and slide fan impeller (fig. 4-12) on motor shaft. Install four screws and flat washers.

(4) Connect motor electrical connector.

(5) Refer to figure 4-2 and install house covers.

## **Section XIV. MAINTENANCE OF FAN MOTOR SWITCHES**

### **-39. Evaporator Fan Motor Speed Control Switch.**

The evaporator fan motor speed control switch is a toggle switch which is part of the control module. Replacement instructions for this switch are included with the control module.

### **-40. Condenser Fan Motor Speed Control.**

**a. General.** The condenser fan motor speed control thermostatic switch, located on the rear wall of the housing, automatically controls the fan motor speed. The switch is normally open and closes on temperature rise between 95°F and 105°F (35°C and 40.6°C). When the switch contacts close the condenser fan relay coil is energized and the relay shifts the fan motor circuit from low-speed to high-speed.

**b. Testing.** Test the switch and connector assembly in the air conditioner as follows:

(1) Refer to figure 4-5 and remove rear cover.

(2) Disconnect electrical connector located just below condenser motor electrical connector (fig. 4-12).

(3) Check for continuity between terminal of connector. There should be no continuity between terminals when temperature is below 95°F (35°C). If a source of heated air is available, check closing of contacts and continuity between terminals at 95°F to 105°F (35°C to 40.6°C).

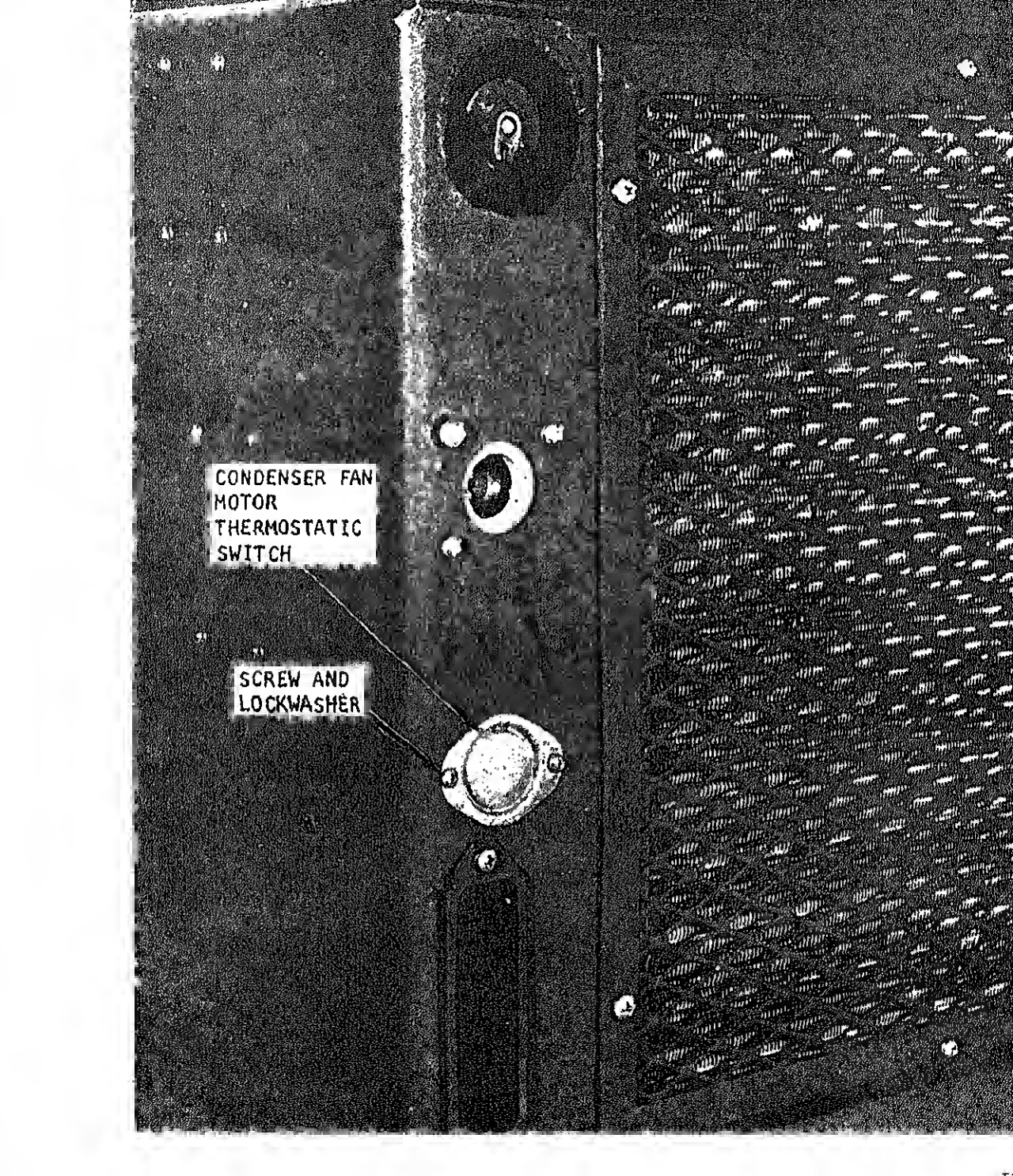
(4) If switch and connector assembly do not meet requirements, check wiring and repair damaged wiring or replace switch.

**c. Removal.** With top cover removed and electrical connector disconnected, proceed as follows:

(1) Refer to figure 4-15 and remove screws and lockwashers. Remove switch and connector assembly.

(2) Disconnect switch leads from connector.





CONDENSER FAN  
MOTOR  
THERMOSTATIC  
SWITCH

SCREW AND  
LOCKWASHER

*d. Installation.* Install the condenser fan thermostat switch as follows:

- (1) Connect switch leads to connector.
- (2) Refer to figure 4-15 and install switch in opening. Secure switch with two screws and lock-

washers.

(3) Connect electrical connector.

(4) Refer to figure 4-5 and install cover.

## **Section XV. MAINTENANCE OF CONTROL MODULE**

### **4-41. General.**

The control module is located in a compartment in the junction box. All electrical connections to the control module are through plug-in type connectors permitting easy removal of the module as a unit. The control module contains the compressor circuit breaker, temperature selector switch, mode selector rotary switch, and the evaporator fan speed toggle switch.

#### **WARNING**

**Disconnect air conditioner from power source before removing control module.**

### **4-42. Control Module.**

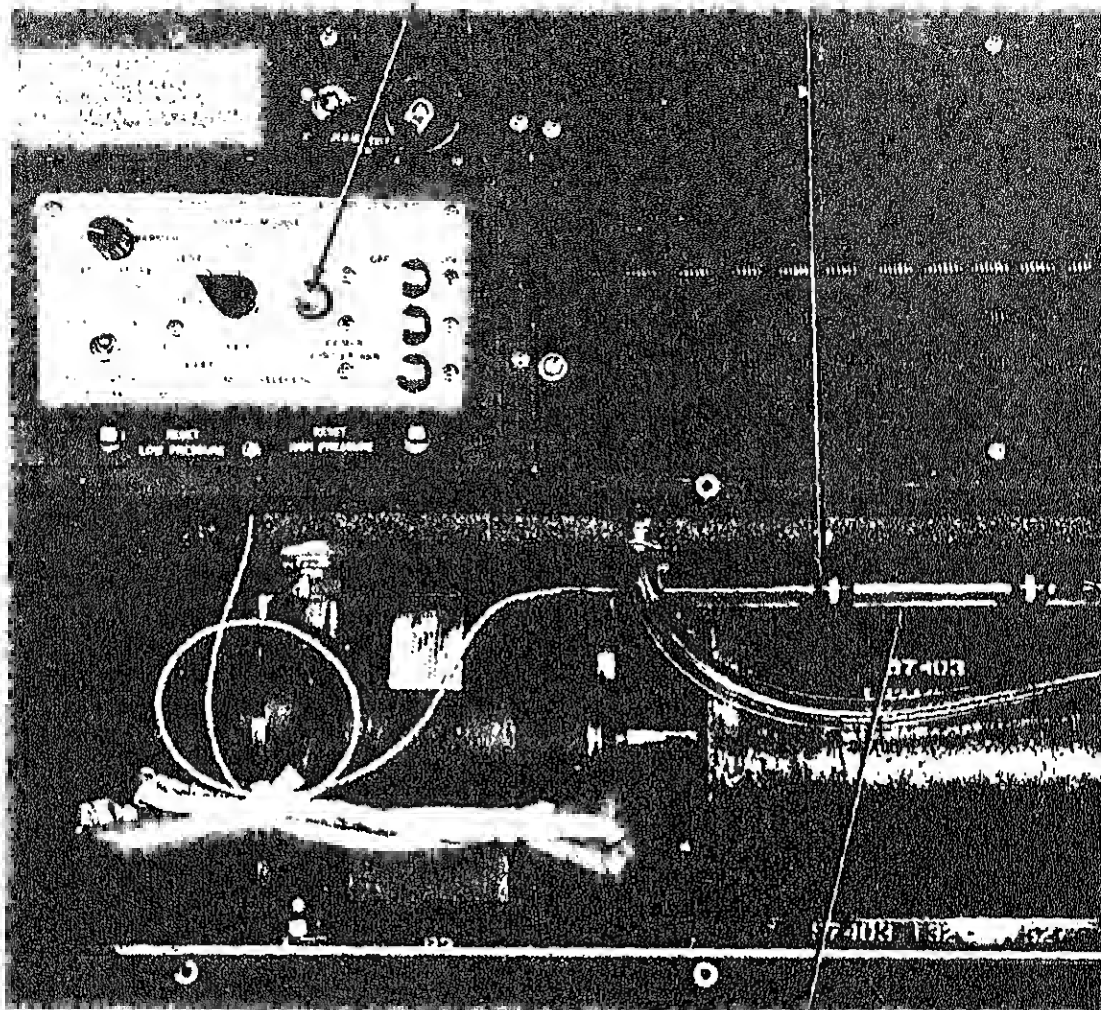
#### *a. Removal.*

(1) Refer to figure 4-2 and remove evaporator air inlet louver.

(2) Refer to figure 4-16 and disconnect temperature selector switch bulb from clamping clamp screws.

(3) Turn connector knob (fig. 4-17) clockwise until screw is disengaged and remove module from junction box. Carefully disconnect temperature selector switch bulb through slot of junction box.





TEMPERATURE TS 4120-3  
SELECTOR  
SWITCH BULB

Figure 4-16. Control module connector knob and bulb mounting.

**b. Testing.**

(1) **General.** Remove four screws securing cover to frame. Remove capillary tube grommet and slide cover from module. Pull capillary tube bulb through hole in cover. To test individual components, mark and disconnect leads, and check for continuity. Refer to schematic diagram as a guide and refer to the following additional instructions.

(4) **Temperature Selector**  
for continuity between common to  
terminal 2. Switch should close w  
drops below setting. Turn swit  
COOLER position. Switch shoul  
switch knob toward WARMER. Sw  
as setting becomes higher than b

...ment of individual controls. Remove control  
...ule cover and mark and disconnect leads of con-  
...to be replaced.

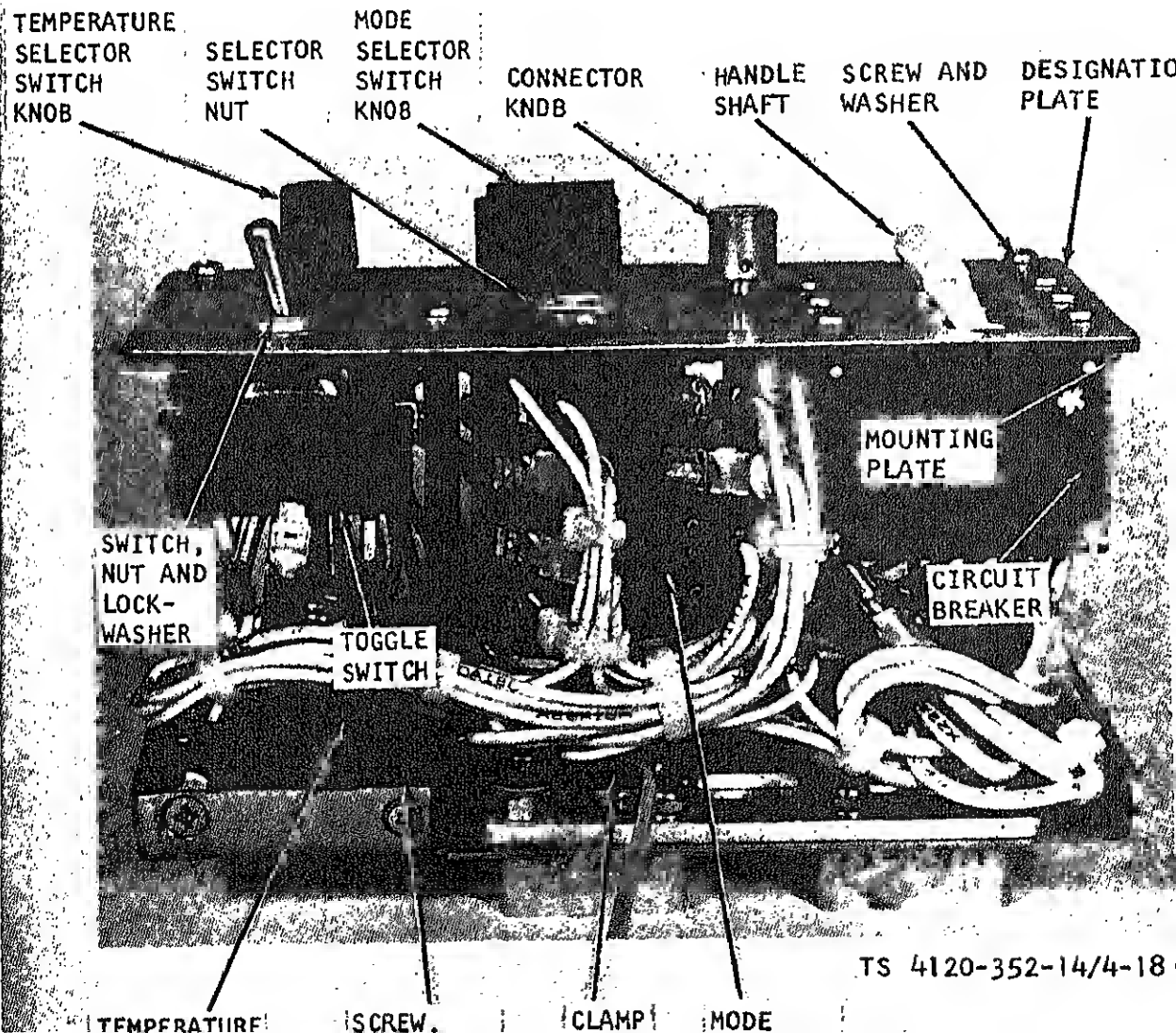
(2) **Circuit Breaker.** Refer figure 4-17 and  
...ove handle shaft and spacers. Remove six  
...ws and washers that secure circuit breaker to  
...nting plate and designation plate and remove  
...uit breaker.

(3) **Evaporator Fan Toggle Switch.** Refer

...to figure 4-17 and remove the switch nut and  
...washer. Remove toggle switch.

(4) **Temperature Selector Switch.** Refer  
...figure 4-17 and remove nut and capillary to  
...clamp. Remove four screws, nuts, and washers.  
...move switch knob and temperature selector switch.

(5) **Mode Selector Rotary Switch.** Refer  
...switch 4-17, loosen setscrew in knob and remove  
...knob. Remove switch nut and switch.



*c. Assembly.*

(1) **General.** Refer to figure 4-17 and install any components that were removed. Complete the assembly as described in (6) below.

(2) **Circuit Breaker.** Install circuit breaker, screws and washers. Assemble handle spacers and shaft.

(3) **Evaporator Fan Toggle Switch.** Install toggle switch and secure to mounting plate with switch nut and lockwasher.

(4) **Temperature Selector Switch.** Install switch and secure with four screws, washers, and nuts. Install switch knob. Install clamp on capillary tube and secure clamp with nut.

(5) **Mode Selector Rotary Switch.** Install switch and secure with switch nut. Install knob and

tighten setscrew.

(6) **Control Module.** After components have been installed, make all necessary electrical connections. Insert capillary tube bulb through slot in cover. Install cover and mounting screws. Install capillary tube grommet.

*d. Installation.*

(1) Install temperature selector switch and tube through slot in junction box. Install in clamps (fig. 4-16) and tighten screws.

(2) Install control module into junction box and turn connector knob clockwise until tight.

(3) Refer to figure 4-2 and install external air inlet louver.

## **Section XVI. MAINTENANCE OF JUNCTION BOX**

### **4-43. Junction Box.**

The junction box (Fig. 1-1) contains the time delay relay, control circuit breaker, condenser fan relay, heater relay, and the compressor motor relay.

*a. Removal.*

(1) Refer to figure 4-5 and remove front top cover. Refer to paragraph 4-42 and remove control module.

(2) Remove seven screws and lockwasher securing junction box to housing. Partially remove the junction box by pulling the box forward from the air conditioner. See figure 4-18. Separate junction box to relieve strain on wiring.

(3) To completely remove the junction box is necessary to disconnect all the electrical wires and connectors.

JUNCTION  
BOX

87403  
132105

87403

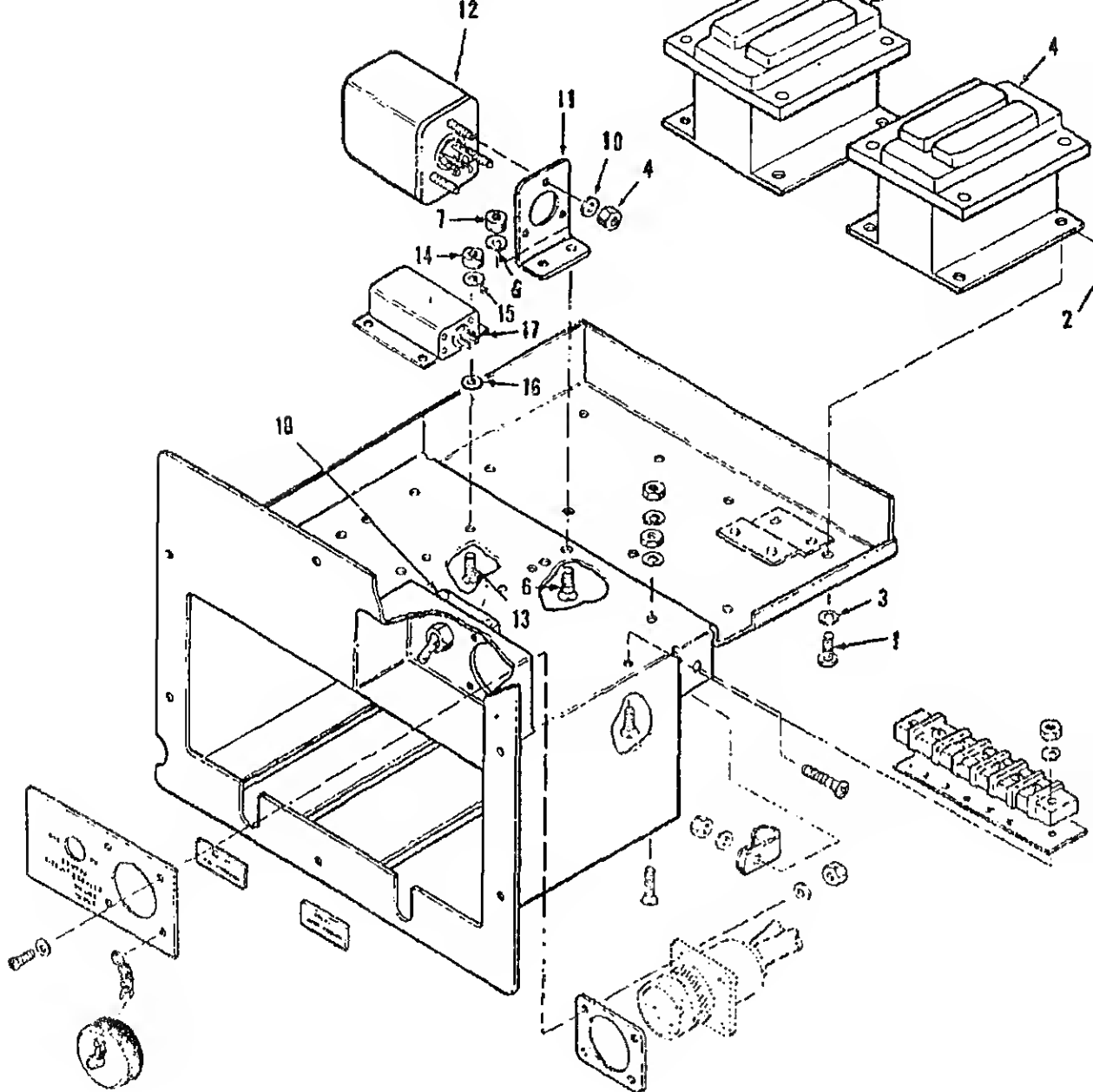
or starting heater or compressor and wiring diagrams and test components for continuity after disconnecting leads. Check coils of armature relays for continuity then actuate the coil with a 24-volt dc source and check across contacts that should be closed according to the schematic diagram. Check circuit breaker in open and closed position.

*c. Disassembly.*

(1) **General.** Disassembly is limited to replacement of individual components. Tag and dis-

connect components before removal. To remove armature relays, refer to figure 4-19 and remove as follows:

- (a) Remove four screws (1) and washers (3). Remove compressor motor relay (4).
- (b) Follow same procedure to remove heater relay (5).



TS 4120-352-14/

- 1 SCREW, PAN-HD, 10-32 X 5/8
- 2 NUT, HEX SLFLKG, 10-32
- 3 WASHER, FLAT, NO. 10

- 10 WASHER, FLAT, NO. 6 (.156 ID)
- 11 BRACKET
- 12 CONDENSER FAN RELAY

(3) **Condenser Fan Relay.** Refer to figure 4-19 and remove relay as follows:

(a) Remove two screws (6), nuts (7), and flat washers (8). Remove relay and bracket from junction box.

(b) Remove three nuts (9) and flat washers (10) to separate bracket (11) from condenser fan relay (12).

(4) **Time-Delay Relay.** To remove the time delay relay, refer to figure 4-19 and remove relay as follows:

(a) Remove four screws (13), nuts (14), and washers (15).

(b) Remove relay (17) and two each of washers (15) and (16).

(5) **Control Circuit Breaker.** To remove the control circuit breaker (18, fig. 4-19), remove circuit breaker nut from front of junction box and pull breaker to the rear of the junction box.

*d. Assembly.*

(1) **General.** Refer to figure 4-19 and install any components that were removed. After installation of components, make all the necessary electrical connections.

(2) **Control Circuit Breaker.** Install control

circuit breaker (18) through opening in junction box with locating projection in opening. Install breaker nut.

(3) **Time Delay Relay.** Install relay (17) on junction box. Secure relay to junction box with four screws (13), nuts (14), and washers (15).

(4) **Condenser Fan Relay.** Install condenser fan relay (12) on bracket (11) and secure with three nuts (9) and flat washers (10). Install bracket on junction box and install two screws (6) and washers (8).

(5) **Heater and Compressor Relays.** Install heater relay (5) or compressor relay (4) and secure relay with four screws (2) and flat washers (3).

*e. Installation.*

(1) Make any electrical connections after components are disconnected during removal.

(2) Carefully install junction box on control module and install seven screws and lockwashers.

(3) Refer to paragraphs 4-42 and 4-43 for control module.

(4) Refer to figure 4-5 and install control cover.

## Section XVII. MAINTENANCE OF TRANSFORMER, RECTIFIER, AND CONTROL SWITCHES

### 4-44. General.

The power transformer and rectifier reduce the power voltage and convert the alternating current to 24-volt direct current to operate the coils and switches in the control circuit. The transformer is rated at a secondary voltage of 30 VAC with a primary voltage of 120 VAC. The transformer and rectifier are located below the junction box. The high and low pressure cutout switches are also located below the junction box with the reset buttons extending through the front of the housing. The pressure cutout switches are connected in the refrigeration system and are electrically connected in the control system to the compressor motor relay coil. Extreme high or low pressure opens the circuit causing the compressor to stop.

(1) Refer to figure 4-5 and remove control cover. Refer to paragraph 4-43 and partially remove junction box.

(2) Disconnect leads and check for shorts across the primary winding and then across the secondary winding. If either winding is shorted, replace the transformer.

(3) Check for grounds between one terminal of each winding and transformer case and between one primary terminal and one secondary terminal using an insulation tester, megohmmeter on high ohms setting. Replace transformer if a short or ground is indicated.

**b. Removal.** With junction box removed, refer to figure 4-20 and remove four screws and flat washers. Disconnect and remove trans-



RECTIFIER

CAPACITOR

TRANSFORMER

RESISTOR

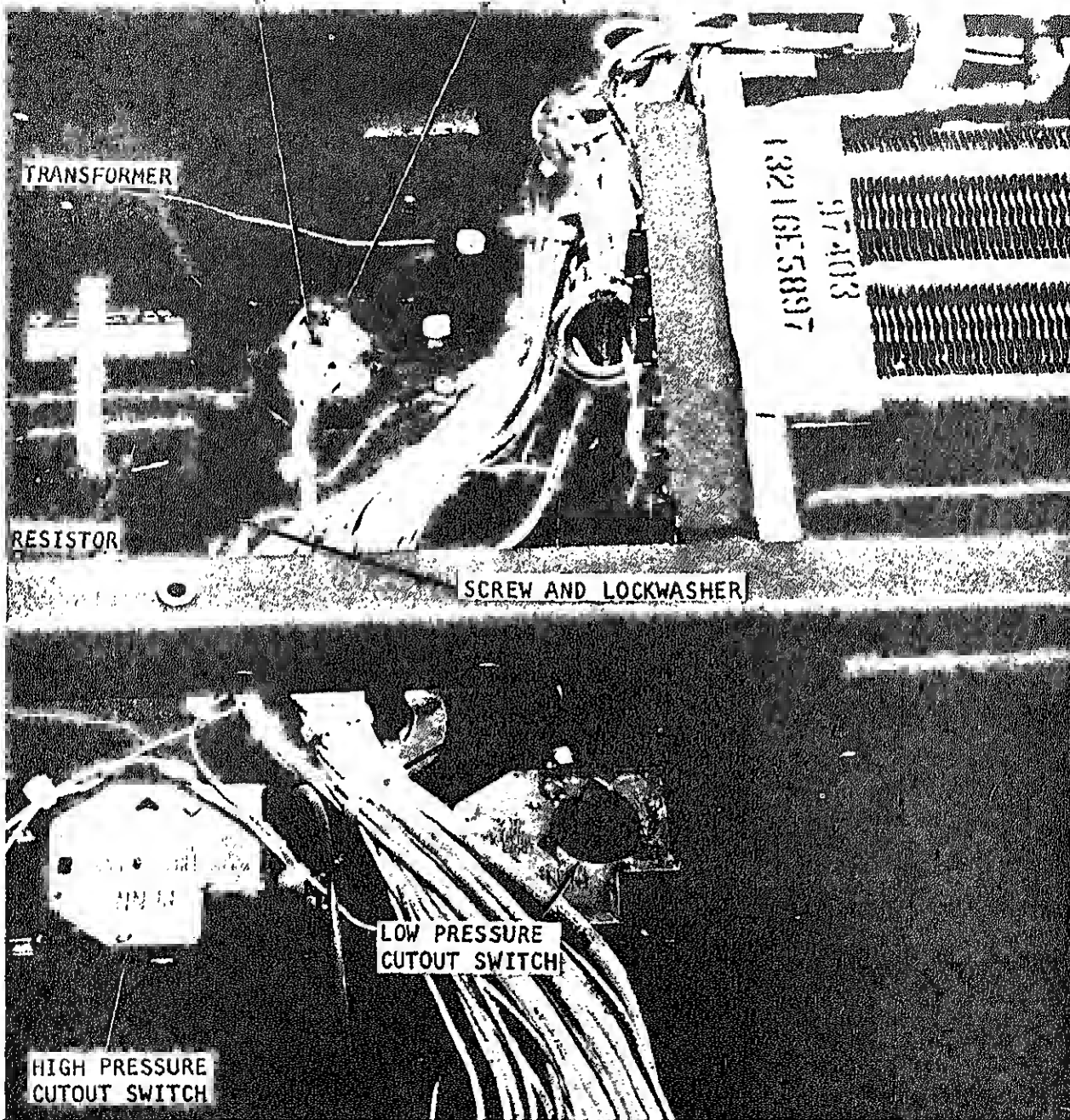
SCREW AND LOCKWASHER

132165897

97403

LOW PRESSURE  
CUTOUT SWITCH

HIGH PRESSURE  
CUTOUT SWITCH





#### 4-46. Rectifier.

*a. Removal.* Remove rectifier as follows:

(1) Refer to paragraph 4-43 and remove junction box.

(2) Refer to figure 4-20 and remove filter capacitors. Disconnect leads.

(3) Remove two cap screws and remove rectifier.

*b. Testing.* Apply a 30 volt ac source of power across the no. 1 and 3 terminals. Check for 24 to 28 volt dc output across terminals 2 and 4. Replace rectifier if defective.

*c. Installation.* Refer to figure 4-20 and install rectifier as follows:

(1) Install rectifier and two cap screws.

(2) Connect leads and install capacitors: the .056 mfd capacitor between rectifier terminals 1 and 3; the 10,000 pfd between terminals 2 and 4.

(3) Refer to paragraph 4-43 and install junction box.

tion box.

#### 4-47. High and Low Pressure Switches.

*a. General.* The high and low pressure switches cannot be removed without opening the refrigeration system. Electrical tests should be made with the switches installed.

*b. Testing.* Test switches as follows:

(1) Refer to paragraph 4-43 and install junction box.

(2) Disconnect leads and test for continuity across terminals of switch. If no continuity is indicated, press reset button and recheck.

(3) If switch is defective, report to maintenance for direct support maintenance.

(4) If switch is not defective, connect leads and install junction box.

### Section XVIII. MAINTENANCE OF COMPRESSOR

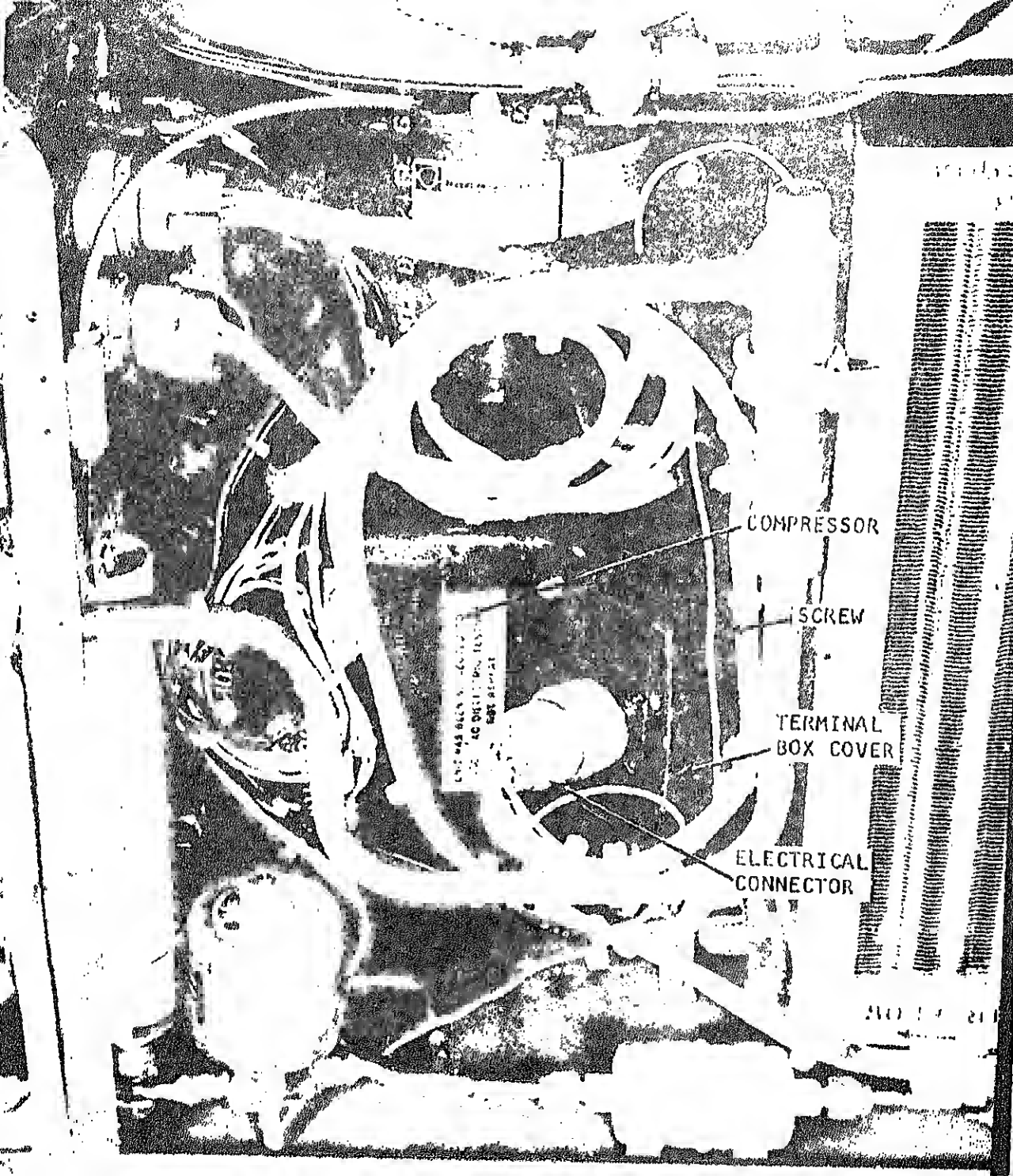
#### 4-48. General.

Organizational maintenance of the compressor is limited to the inspection, testing and repair of the electrical equipment.

#### 4-49. Inspection, Testing and

*a.* Refer to figure 4-5 and remove the top cover.

*b.* Refer to figure 4-21 and disconnect the connector.



COMPRESSOR

SCREW

TERMINAL  
BOX COVER

ELECTRICAL  
CONNECTOR

100-445 0000 1-0000  
100-445 0000 1-0000  
100-445 0000 1-0000

test motor.

d. If any difficulty is indicated, remove screws and terminal box cover and check for damaged wiring or loose connections. Repair damaged wiring and tighten loose connections. If this does not cor-

## Section XIX. MAINTENANCE OF REFRIGERATION SYSTEM

### 4-50. General.

Organizational maintenance of the refrigeration system is limited to inspection and testing of the system. Remove top covers, louvers and partially remove junction box as required to gain access to all parts of the system. Report any deficiencies to direct support maintenance.

### 4-51. Inspection.

a. *Valves.* Inspect charging valves, solenoid valves, expansion valves, pressure relief valves and pressure regulating valves for cracks or damaged condition. Inspect capillary tubes for kinks or breaks. Disconnect solenoid valve electrical connectors and check for coil continuity between terminals.

b. *Coils.* Inspect condenser and evaporator coils for bent or broken fins and for damaged connections.

c. *Louver Control Actuator.* Inspect cylinder for cracks and damaged connections. Inspect control for bent or broken conditions.

d. *Dehydrator and Receiver.* Inspect dehy-

drator and receiver for damage.

e. *Install terminal box cover and screws.* Connect electrical connector. Refer to figure 4-5 and install housing rear top cover.

drator and receiver for damage.

c. *Tubing and Fittings.* Inspect tubing for kinks, cracks or other damage. Inspect fittings for cracks.

### 4-52. Testing System for Leaks.

Check all piping, components, and connections of the refrigerant system with a General Electric H-2 Halogen Test Detector unit (or approved equivalent). The detector shall be calibrated with a General Electric LS-20 leak standard (or approved equivalent) to a pure refrigerant leak rate of 0.1 ounce per hour. Any detected leaks exceeding this rate shall be reported immediately to direct support maintenance for correction and recharging.

#### WARNING

Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant does not come in contact with the eyes. In case of refrigerant leaks, ventilate area immediately.

# LECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

---

## Section I. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

### Tools and Equipment

o tools or equipment are issued with the air conditioner.

### Special Tools and Equipment

o special tools or equipment are required for

maintenance of the air conditioner.

### 5-3. Maintenance Repair Parts

Repair parts and equipment are listed and illustrated in the repair parts and special tool list covering direct and general support maintenance for this equipment. (TM 5-4120-352-24P)

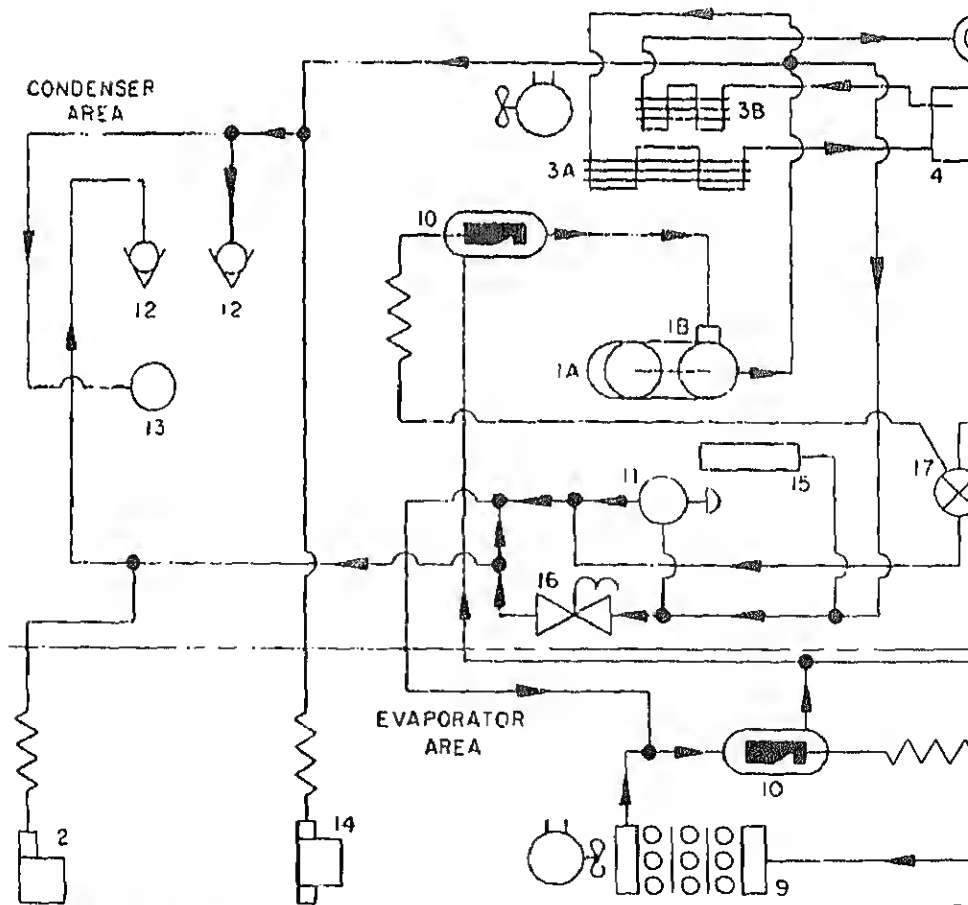
## Section II. TROUBLESHOOTING

### General

his section provides information useful in diagnosing and correcting unsatisfactory operation or o of the air conditioner or any of its com-

ponents. Electrical schematic and wiring diagram shown in figure 1-4 and 1-5 will be helpful for checking electrical circuits. A refrigerant flow diagram is shown in figure 5-1. System pressure test instructions are in paragraph 6-2.

1	13208E4182	1	COMPRESSOR, RECIPROCATING
2	13216E6215-1	1	SWITCH, PRESSURE (LOW)
3A	13216E5904	1	COIL, CONDENSER WITH ANGLE
3B	PT OF FIND NO. 3A	1	SUBCOOLER
4	13216E6163-1	1	RECEIVER, LIQUID REFRIGERANT
5	13216E6155	1	INDICATOR, SIGHT, LIQUID
6	13216E5918-1	1	DEHYDRATOR, DESICCANT, REFRIGERANT
7	13216E6172-1	1	SOLENOID VALVE WITH LEADS
8	13216E6160-1	1	VALVE, EXPANSION (PRIMARY)
9	13216E5897	1	COIL EVAPORATOR WITH ANGLE
10	13216E5921	2	BULB WELL
11	13216E6171	1	REGULATOR, FLUID PRESSURE
12	13219E9499	2	VALVE, CHARGING, WITH CAP
13	13211E8369	1	VALVE, PRESSURE RELIEF
14	13216E6215-3	1	SWITCH, PRESSURE (HIGH)
15	13216E6128	1	CYLINDER ASSY, ACTUATING, LINEAR
16	13216E6172-2	1	SOLENOID VALVE WITH LEADS
17	13216E6174-1	1	VALVE, EXPANSION (QUENCH)



## 5-5. Troubleshooting Chart

Troubleshooting procedures for direct and general support maintenance are listed in table 5-1.

Each trouble symptom or malfunction stated is followed by a step-by-step procedure for inspecting and testing the system to determine the specific cause of fault or failure. The corrective action recommended follows the determination of probable cause.

*Table 5-1. Troubleshooting*

---

### Malfunction

#### Test or Inspection

#### Corrective Action

---

### 1. COMPRESSOR WILL NOT START

- Step 1.* Test for an open-circuit condition in the control circuit by means of a continuity check.  
Replace component or wire causing open circuit (para 4-12).
- Step 2.* Test circuit breaker for defective operation.  
Replace defective circuit breaker (para 4-43).
- Step 3.* Check to see if high or low pressure cutout switch is defective.  
Replace defective switch (para 5-21).
- Step 4.* Check to see if compressor motor or thermal protectors are defective.  
Replace compressor (para 5-17).

### 2. COMPRESSOR STARTS BUT IMMEDIATELY STOPS

- Step 1.* Check to see if thermal protector or circuit breaker is tripped.  
Reset circuit breaker, or allow thermal protector to cool and reset. If condition repeats, replace compressor (para 5-17).

### 3. LITTLE OR NO HEATING CAPACITY.

- Step 1.* Check for loose electrical connections or faulty wiring.  
Repair or replace wiring as necessary (para 4-33).
- Step 2.* Test mode selector switch and temperature selector for faulty closure in heat control circuit.  
Replace defective switch (para 4-42).
- Step 3.* Test heater relay for faulty contact closure.  
Replace defective relay (para 4-43).

---

Malfunction	Test or Inspection	Corrective Action
-------------	--------------------	-------------------

---

#### 4. INSUFFICIENT COOLING

- |                |  |
|----------------|--|
| <i>Step 1.</i> | Test for low refrigerant charge.<br>Add refrigerant (para 6-3).  |
| <i>Step 2.</i> | Check for indications of a clogged dehydrator.<br>Replace clogged dehydrator (para 4-43).              |
| <i>Step 3.</i> | Check for indications of a defective pressure regulator valve.<br>Replace defective valve (para 6-30). |
| <i>Step 4.</i> | Check for indications of air in system.<br>Purge and charge system (fig. 6-1).                         |
| <i>Step 5.</i> | Check for indications of a defective thermal expansion valve.<br>Replace defective valve (para 6-28).  |
| <i>Step 6.</i> | Check for indications of defective solenoid valve.<br>Replace defective solenoid valve (para 6-27).    |
| <i>Step 7.</i> | Check for indications of defective quench valve.<br>Replace defective valve (para 6-29).               |

#### 5. LOW SUCTION PRESSURE

- |                |   |
|----------------|---|
| <i>Step 1.</i> | Check for indications of a clogged dehydrator.<br>Replace clogged dehydrator (para 6-24).             |
| <i>Step 2.</i> | Check for indications of a defective thermal expansion valve.<br>Replace defective valve (para 6-28). |
| <i>Step 3.</i> | Check for indications of a defective quench valve.<br>Replace defective valve (para 6-29).            |

#### 6. LOW DISCHARGE PRESSURE

- |                |   |
|----------------|---|
| <i>Step 1.</i> | Check to see if compressor is not pumping due to defect.<br>Replace defective compressor (para 6-17).             |
| <i>Step 2.</i> | Check to see if HIGH LOW condenser fan thermostatic switch is defective.<br>Replace defective switch (para 4-39). |

**Malfunction**

**Test or Inspection**

**Corrective Action**

**LOW SUCTION AND DISCHARGE PRESSURE**

- Step 1.* Check for low refrigerant charge by inspecting sight glass for bubbles or milky appearances. Also check system for leaks.  
Repair leaks and add refrigerant as necessary.
- Step 2.* Check for indications of defective thermal expansion valve.  
Replace valve (para 5-28).
- Step 3.* Check for indications of defective quench valve.  
Replace valve (para 5-29).

**HIGH SUCTION PRESSURE**

- Step 1.* Check for indications of defective thermal expansion valve.  
Replace valve (para 5-28).
- Step 2.* Check for indications of defective quench valve.  
Replace valve (para 5-29).

**HIGH HEAD PRESSURE**

- Step 1.* Check to see if condenser coil is dirty.  
Clean coil.
- Step 2.* Check condenser coil temperature gradient for indications of refrigerant overcharge.  
Discharge refrigerant (fig. 3-1) while observing head pressure and sight glass.
- Step 3.* Inspect or test condenser fan motor for defective operation.  
Repair motor (para 6-8).
- Step 4.* Inspect condenser louvers and actuating mechanism for correct adjustment and proper operation.  
Adjust and clean as necessary. Replace inoperative components (para 5-20).
- Step 5.* Check for indications of defective quench valve.  
Replace defective valve (para 5-29).
- Step 6.* Check to see if the compressor is defective.  
Replace defective compressor (para 5-17).



## **5-8. General.**

This section contains general repair instructions which would otherwise have to be repeated several times.

## **5-7. Refrigeration System.**

*a. Opening System.* When the refrigeration system must undergo maintenance that requires the system to be opened for removal of parts, the system must first be discharged and purged (para 6-3). After the repair has been made and all soldering completed, the system must be charged (para 6-3) and tested for leaks.

*b. Removal of parts.* It may be necessary to remove some tubing and fittings along with a part that is to be replaced. The tubing and fittings can then be removed from the defective part and installed in the new part. Care should be exercised in opening joints or resoldering to prevent damage to other parts of the air conditioner.

*c. Brazing.* Brazed copper-to-copper joints with silver solder type 3, 4 or 6A specification QQ-S-561 and copper-to-brass or copper-to-steel with type 4 or 6A specification QQ-S-561 per MIL-B-7883. Solder melting point is 1160°F (625°C). All brazed or soldered joints shall be made with an atmosphere of inert gas to prevent internal oxidation.

## **5-8. Insulation and Gaskets.**

Replace damaged insulation and gaskets. Cement loose insulation.

## **5-9. Hardware.**

Replace any damaged screw, washers, lock washers or nuts. Use screws of correct length to hold parts securely. In some applications screws that are too long may hit bottom before the head is tight against part it is to hold or may cause damage to the threads or other parts.

## **5-10. Shims.**

Be sure to remove all shims where used. Keep shims together and identify them as to location.

## **5-11. Repairing Damaged Threads.**

Damaged threads should be repaired by use of thread restorer or by chasing in a lathe. Internal threads should be repaired with a tap of the correct size. If threads cannot be satisfactorily repaired, replace the part.

## **5-12. Repair of Damaged Machine and Polished Surfaces.**

Smooth rough spots, scores, burrs, gelling, and gouges from damaged machined and polished surfaces so that part will efficiently perform its normal function. The finish of the repaired part is to approximate that of the original finish. In performing any of these operations, critical dimensions must not be altered.

## **5-13. Removal of Rust or Corrosion.**

Remove corrosion from all parts of material. To remove rust or corrosion, use wire brush, abrasive cloth, sand blast, vapor blast equipment, or rust remover except on highly polished surfaces. On these surfaces, buffing or the use of the use of crocus cloth is recommended.

## **5-14. Tubes and Fittings.**

Check tubes and fittings for cracked or spalled condition. Check tubing for kinks. Replace defective fittings. Replace damaged tubing with tubing of same size. Take care in making bends in tubing to prevent kinking of tubing. All tubing and fittings must be completely clean on inside prior to installation.

## **5-15. Valves.**

Valves and other parts should be handled carefully to prevent damage. Capillary tubes must be handled very carefully to prevent kinking of the tubes.

## Section IV. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS AND ASSEMBLIES

### 5-16. General.

This section covers removal of all major assemblies of the air conditioner which are the responsibility of the direct support and general support maintenance. The refrigerant piping and valves cannot be removed as a unit and only those parts that require replacement should be removed. Removal and installation instructions for individual valves and other components of the refrigeration system are contained in this section. Refer to paragraph 5-7 before performing maintenance on the refrigeration system.

### 5-17. Compressor.

*a. General.* The compressor is a self-contained, hermetically sealed unit and cannot be repaired.

*b. Removal.* Remove compressor as follows:

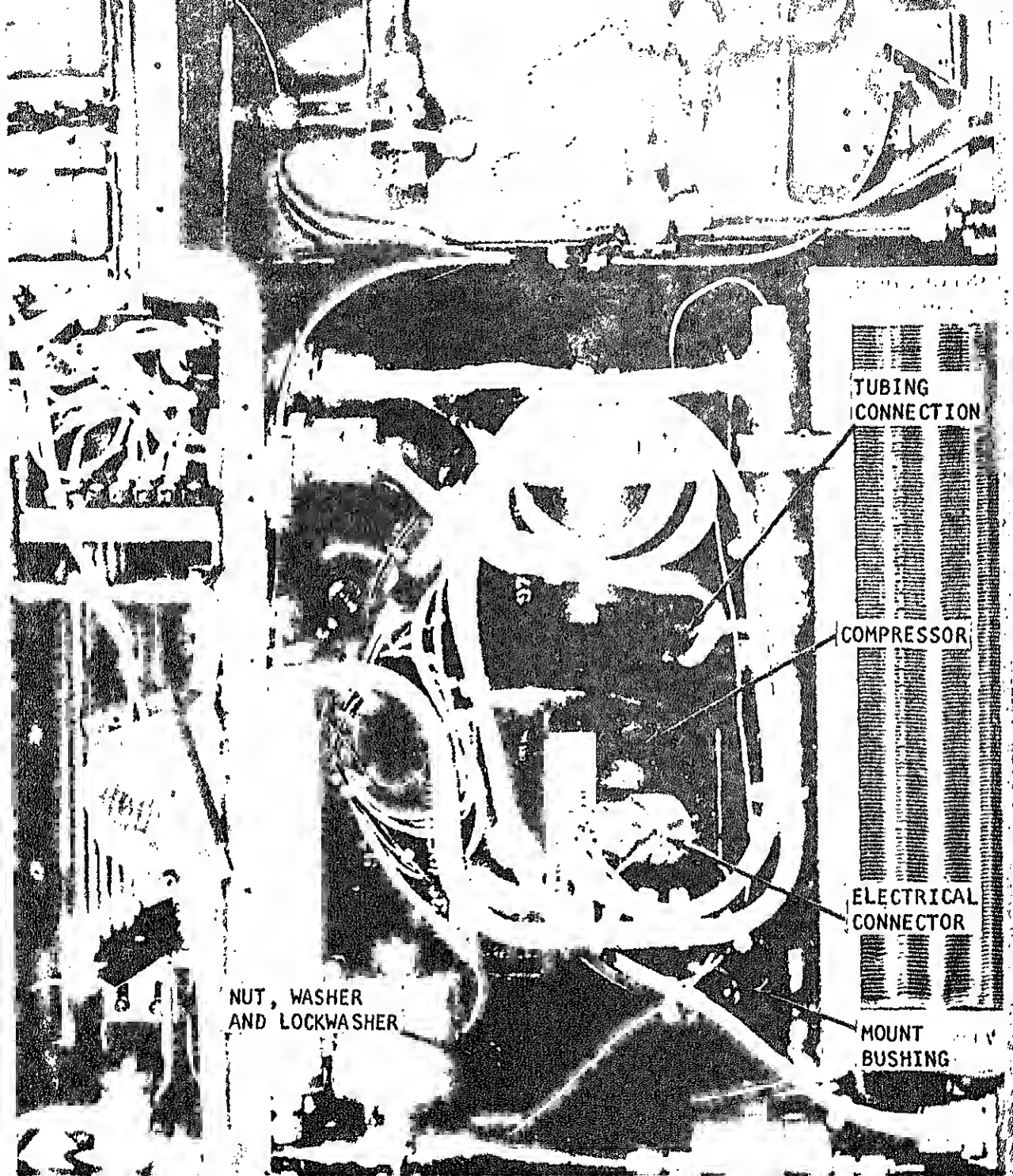
(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to figure 4-5 and remove top cover.

(3) Refer to figure 5-2 and disconnect electrical connector.

(4) Disconnect tubing as required to permit removal of compressor.

(5) Remove four screws, washers, lock washers and compressor mount bushings.



TUBING  
CONNECTION

COMPRESSOR

ELECTRICAL  
CONNECTOR

NUT, WASHER  
AND LOCKWASHER

MOUNT  
BUSHING

- (6) Lift compressor from air conditioner.

### CAUTION

If compressor is being replaced because of a motor burnout, decontaminate system as instructed in paragraph 6-5. Failure of the replacement compressor will result if all the contaminants are not removed.

*c. Installation.* Refer to figure 5-2 and install compressor as follows:

- (1) Place compressor on mounts and install four compressor mount bushings. Secure compressor with four screws, washers and lock washers.
- (2) Connect tubing.
- (3) Connect electrical connector.

(4) Refer to figure 4-5 and install hood covers.

(5) Refer to paragraph 6-3 and discharge refrigerant system.

## 5-18. Evaporator Coil and Mist Eliminator Holder.

*a. Removal.* Remove the evaporator and mist eliminator holder as follows:

(1) Refer to paragraph 6-3 and discharge refrigerant system.

(2) Refer to figure 4-5 and remove hood covers.

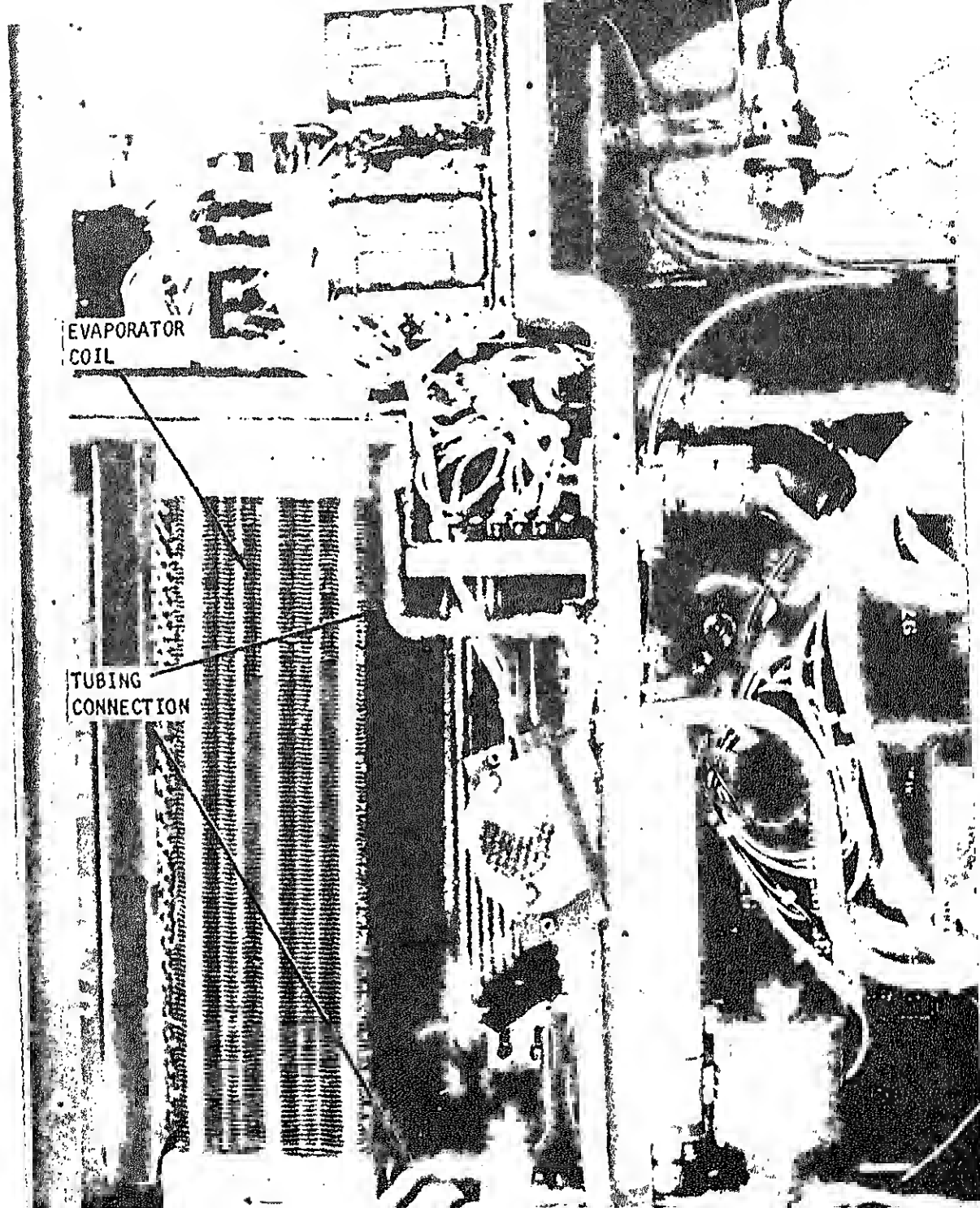
(3) Refer to figure 4-2 and remove evaporator air outlet louvers and mist eliminator.

(4) Refer to figure 5-3 and disconnect from evaporator coil.

(5) Remove six screws, washers, and lock washers and lift evaporator coil and angle; and mist eliminator holder, from air conditioner.

EVAPORATOR  
COIL

TUBING  
CONNECTION



**Installation.** Install evaporator coil and eliminator holder as follows:

(1) Install coil and mist eliminator holder in conditioner and secure to brackets with six washers, and lock washers. The lower four washers and lockwashers attach both the coil and mist eliminator holder; the upper two hold coil only.

(2) Connect tubing to coil.

(3) Refer to figure 4-2 and install evaporator outlet louver.

(4) Refer to figure 4-5 and install housing top covers.

(5) Refer to figure 6-2 and charge the refrigerant system.

## **9. Condenser Coil.**

**Removal.** Remove condenser coil as follows:

(1) Refer to figure 6-1 and discharge the refrigerant system.

(2) Refer to figure 4-5 and remove housing top covers.

(3) Refer to figure 5-4 and remove screw that secures bulb well loop clamp to condenser coil angle.

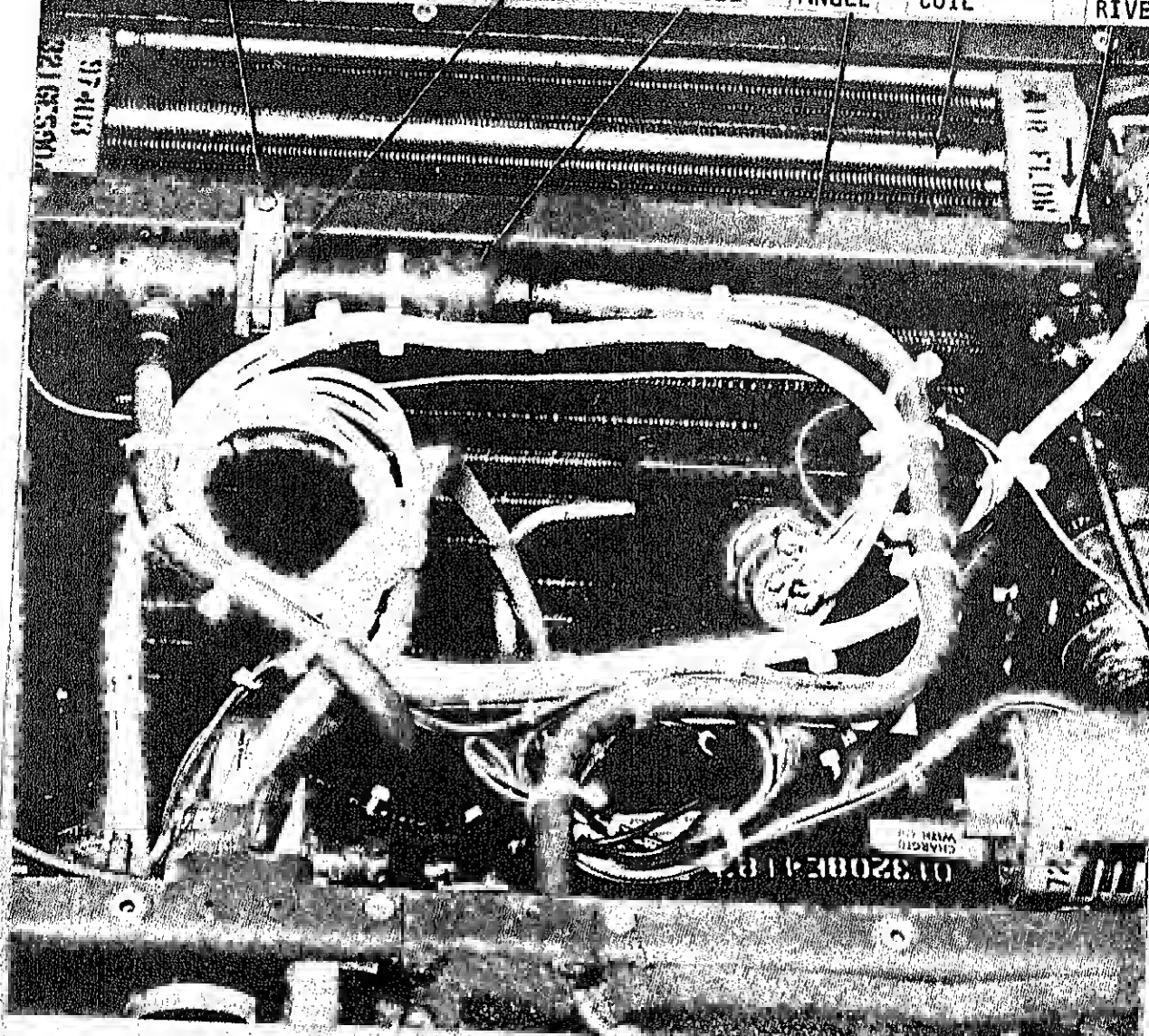
(4) Disconnect tubing from condenser coil and remove other tubing and fittings as required.

(5) Refer to figure 4-3 and remove condenser guard.

(6) Remove four countersunk-head screws that secure coil to base of housing.

(7) Remove coil from air conditioner. Use care when removing coil to prevent damage to coils and fins.

(8) To remove angle from coil, grind off four rivets.



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Figure 5-4. Condenser coil, removal and installation.

**b. Installation.** Install condenser coil as follows:

- (1) If angle was removed from condenser, rivet angle to coil with four blind rivets.
- (2) Be sure sheet spring nuts are in place on bottom of coil. Position coil in air conditioner and install four countersunk-head screws from underside of housing.
- (3) Refer to figure 4-3 and install condenser guard.
- (4) Connect tubing to condenser and install any other tubes and fittings that
- (5) Attach bulb well clamp to angle with screw.
- (6) Refer to figure 4-5 and install housing top covers.

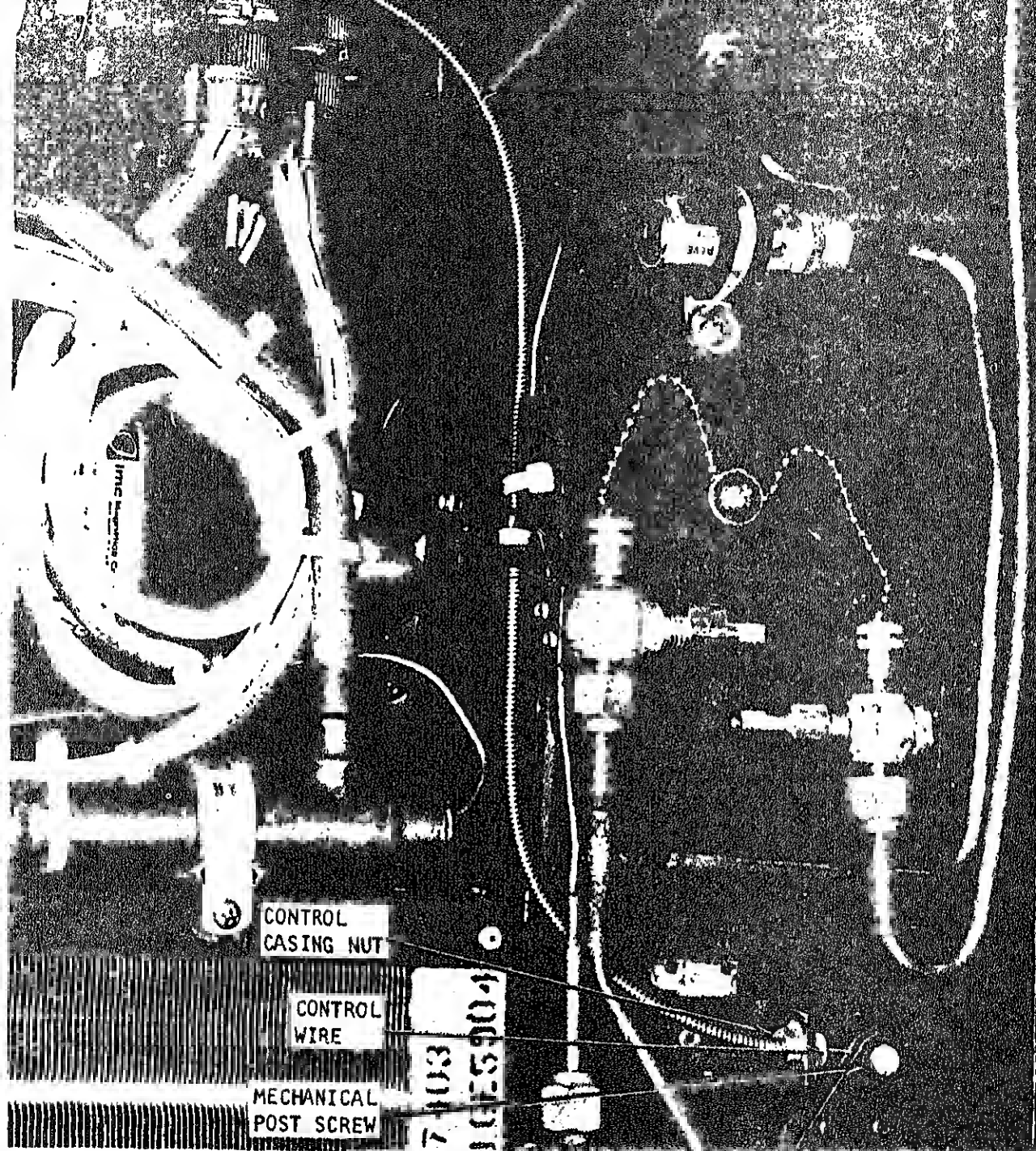
(7) Refer to figure 6-2 and charge the refrigerant system.

## **5-20. Condenser Louver Actuator Control.**

**a. Removal.** Remove actuator and push control as follows:

- (1) Refer to figure 6-1 and discharge the refrigerant system.
- (2) Refer to figure 4-5 and remove housing covers.
- (3) Refer to figures 5-5 and 5-6 and loosen mechanical post screws to loosen control wire.





CONTROL  
CASING NUT

CONTROL  
WIRE

MECHANICAL  
POST SCREW

7403  
1075904

FLOW

LECTED TO  
C. TESTS

1/4 INCH  
ADJUSTMENT  
SPACE

MECHANICAL  
POST SCREW

CONTROL  
WIRE

PUSH-PULL  
CONTROL

(4) Remove screw, lock washer and loop clamp.

(5) Remove control casing outer nuts at each end and remove push-pull control.

(6) Disconnect elbow swivel nut from end of actuator cylinder.

(7) Remove two nuts and lock washers from evaporator side of partition and remove actuator cylinder.

**b. Installation.** Install actuator cylinder end control as follows:

(1) Install actuator cylinder (fig. 5-6) with studs through openings in partition. Install lock washers and nuts on studs.

(2) Connect elbow swivel nut.

(3) Install push-pull control. Place outer control casing nuts (fig. 5-5) over wire and insert wire ends into openings in mechanical posts on louver lever and actuator cylinders.

(4) Install control casing nuts on casing to hold control in position. Install loop clamp, screw, and lock washer.

(5) Adjust control as described in c below.

**c. Adjustment.** Before system is charged, adjust louver push-pull control as follows:

(1) Close louver blades and tighten screw on mechanical post to lock wire on that end.

(2) Extend actuator rod until there is a 1/2 inch space between inner edge of mechanical post bracket end and the face of the cylinder. Tighten the mechanical post screw.

(3) Refer to figure 4-5 and install housing top covers.

(4) Refer to figure 6-2 and charge the refrigerant system.

## 5-21. Pressure Switches.

**a. Removal.** Remove pressure cutout switch (fig. 4-20) as follows:

(1) Refer to figure 6-1 and discharge the refrigeration system.

(2) Refer to paragraph 4-43 and remove junction box. Disconnect electrical leads. Refer to figure 4-5 and remove housing rear and center top covers.

(3) Remove two mounting screws and lock washers from each switch.

(4) Refer to figure 5-7 and disconnect capillary tube nuts. Remove grommet and pull capillary tubes through partition.

CAPILLARY TUBE  
NUT

RELIEF VALVE

LOW PRESSURE  
CHARGING VALVE

HIGH PRESSURE  
CHARGING VALVE

HIGH PRESSURE  
CUTOUT SWITCH  
CAPILLARY TUBE  
NUT

11035311288  
11035311288  
11035311288

*b. Installation.* Install high and low pressure cutout switches as follows:

- (1) Insert capillary tube ends through partition and install grommet (fig. 5-7). Connect capillary tube nuts to fittings.
- (2) Install switches (fig. 4-20) and secure each with two screws and lock washers.
- (3) Make electrical connections to switches.
- (4) Refer to paragraph 4-43 and install junction box. Refer to paragraph 4-21 and install housing top cover.
- (5) Refer to figure 6-2 and charge the refrigerant system.

## 5-22. Service Valves.

*a. Removal.* Refer to figure 6-1 and discharge the refrigerant system. Remove housing rear top covers (figures 4-5). Detach valve cap chain by removing a screw, lockwasher and flat washers. Remove valve by removing two base mounting screws.

*b. Installation.* Mount valve to bracket, using two screws. Affix loops in cap chains to housing with a screw, lockwasher and two flat washers. Connect valves to refrigerant lines by tightening flare nuts. Refer to figure 4-5 and install housing rear top cover. Refer to figure 6-2 and charge the refrigerant system.

## 5-23. Pressure Relief Valve.

*a. Removal.* Refer to figure 6-1 and discharge the refrigerant system. Refer to figure 4-5 and remove housing top covers. Remove screw, lockwasher, and loop clamp (fig. 5-7). Remove pressure relief valve from adapter.

*b. Installation.* Install pressure relief valve (fig. 5-7) in adapter. Install loop clamp on valve and secure clamp with screw and lockwasher. Install housing top cover (fig. 4-5). Refer to paragraph 6-2 and charge the refrigerant system.

## 5-24. Dehydrator.

*a. General.* The dehydrator is to be replaced whenever the refrigeration system is opened for maintenance.

*b. Removal.* Refer to figure 6-1 and discharge the refrigerant system. Refer to figure 4-5 and remove housing rear top cover. Refer to figure 5-8 and remove four screws and two straps. Disconnect and remove dehydrator.

*c. Installation.* Connect dehydrator to tubing. Install two straps and four screws. Use sealing compound on screw threads. Install rear top cover (figure 4-5). Refer to figure 6-2 and charge the refrigerant system.

LIQUID BYPASS  
SOLENOID VALVE

SCREW AND  
SPACER (2)

DEHYDRATOR

RECEIVER

MOUNTING STRAP



### 5-25. Receiver.

*a. Removal.* Refer to figure 6-1 and discharge the refrigerant system. Refer to figure 4-5 and remove rear top cover. Remove four screws and two mounting straps (fig. 5-8). Disconnect receiver tubing.

*b. Installation.* Install receiver and solder connections. Install two mounting straps and four screws using sealing compound on screw threads. Refer to figure 6-2 and charge the refrigerant system.

### 5-26. Liquid Sight Indicator.

*a. Removal.* Refer to figures 6-1 and discharge the refrigerant system. Remove housing rear top cover (figure 4-5). Remove two screws and lockwashers from sides of liquid sight indicator (fig. 1-2) and remove mounting bracket (fig. 5-8) from inside housing. Unsolder liquid sight indicator from tubing.

*b. Installation.* Solder liquid sight indicator on tubing. Place bracket over indicator on inside of housing and secure with two screws and lockwashers. Install housing top rear cover (figure 4-5). Refer to figure 6-2 and charge the refrigerant system.

### 5-27. Solenoid Valves.

*a. Removal.* Removal procedures for the bypass solenoid valve and the equalizer solenoid valve are the same except for the mounting hardware.

(1) Refer to figure 6-1 and discharge the refrigerant system.

(2) Refer to figure 4-5 and remove housing rear top cover.

(3) Disconnect solenoid valve electrical connector.

(4) Remove two socket-head cap screws from underside of valve body and carefully remove bonnet assembly. Do not drop plunger. Remove diaphragm.

**CAUTION**  
Remove bonnet assembly and diaphragm before applying heat to valve body.

(5) To remove liquid bypass solenoid valve (figure 5-8), remove two screws and spacers and unsolder valve body from tubing. Remove bushings.

(6) To remove equalizer solenoid valve, remove two screws and lockwashers that secure valve body to bracket. Unsolder valve body and remove bushings.

*b. Installation.* Install solenoid valves as follows:

(1) Install bushings in valve body and solder body on tubing.

(2) When installing equalizer solenoid valve body, secure body to bracket with two screws and lockwashers installed from underside of bracket into valve body.

(3) When installing liquid bypass solenoid valve body, install spacers between body and housing and install two screws from outside of housing.

(4) Place diaphragm in the body with the pilot port extension away from body. Hold plunger with synthetic seat against pilot port. Make sure pilot formad packings are in place and lower bonnet assembly over plunger. Install body screws.

(5) Connect electrical connector.

(6) Refer to figure 4-5 and install housing rear top cover.

(7) Refer to figure 6-2 and charge the refrigerant system.

### 5-28. Thermal Expansion Valve.

*a. General.* The main thermal expansion valve is hermetically sealed and cannot be repaired.

*b. Removal.* Remove the thermal expansion valve as follows:

(1) Refer to figure 6-1 and discharge the refrigerant system.

(2) Remove housing top covers (figure 4-5).

(3) Soften mastic in bulb well (fig. 5-9) and remove bulb from well. Take care to prevent damage to capillary tube.

(4) Unsolder thermal expansion valve from

THOMAS  
FRANKSON  
MAY 1962

13325191231  
5/11/62

CAPILIARY TUBE



c. **Installation.** Install thermal expansion valve (fig. 5-9) as follows:

(1) Solder valve to tubing.

(2) Insert approximately one ounce of thermal mastic in bulb well. Insert sensing bulb of expansion valve and move bulb back and forth to distribute mastic and set bulb approximately one inch beyond open end.

(3) Install housing top covers (figure 4-5).

(4) Refer to figure 6-2 and charge the refrigerant system.

## 5-29. Quench Thermal Expansion Valve.

a. **General.** The quench thermal expansion valve is hermetically sealed and cannot be removed.

b. **Removal.** Remove the quench valve as follows:

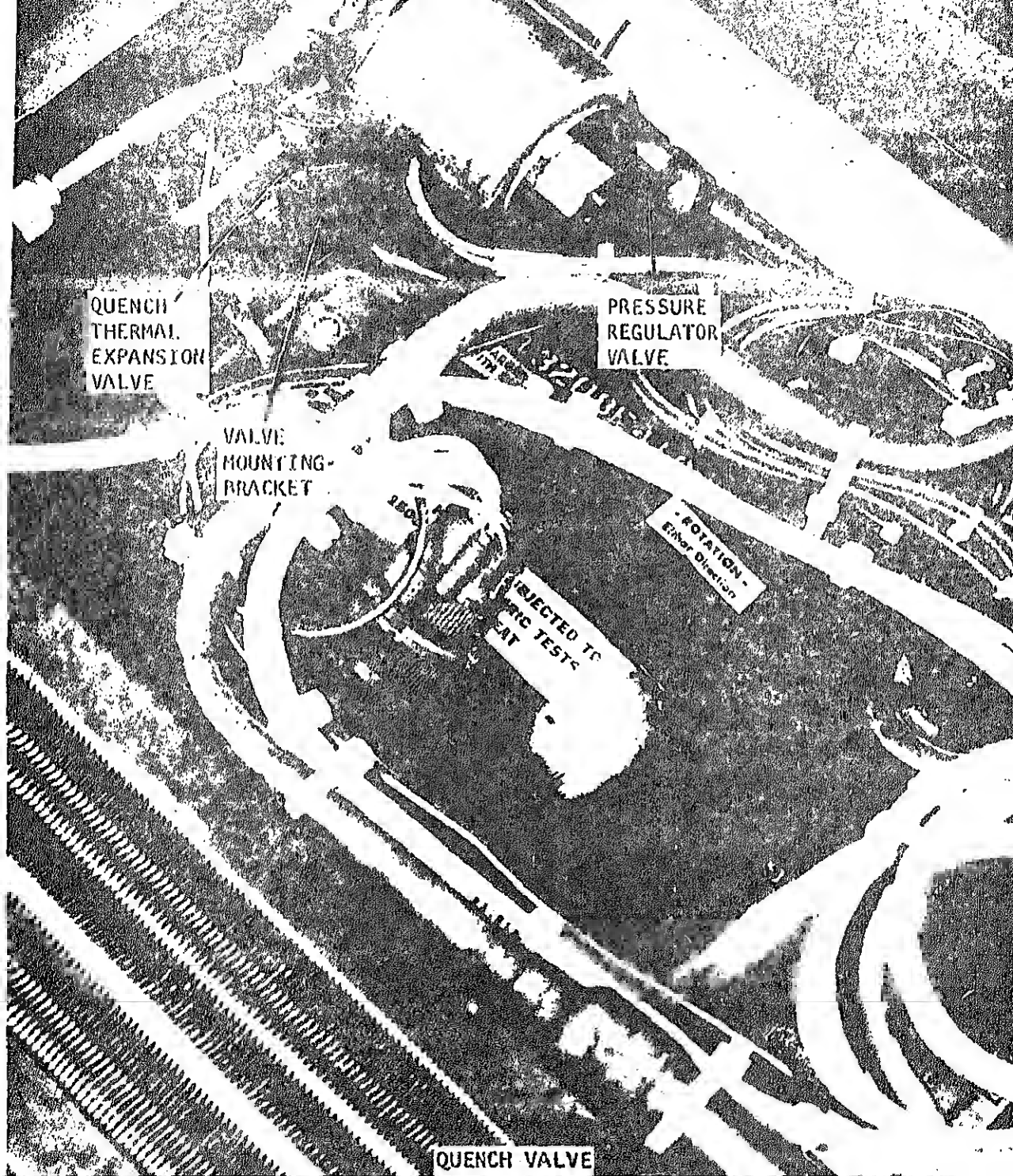
(1) Refer to figure 6-1 and discharge the refrigerant system.

(2) Remove housing rear top cover (figure 5-5).

(3) Soften mastic in bulb well (fig. 5-1) and move bulb from wall. Take care to prevent mastic from entering capillary tube.

(4) Remove two screws, spacers, and nuts and valve mounting brackets.

(5) Unsolder valve from tubing.



QUENCH  
THERMAL  
EXPANSION  
VALVE

PRESSURE  
REGULATOR  
VALVE

VALVE  
MOUNTING  
BRACKET

ROTATION -  
Either Direction

SUBJECTED TO  
HYDRAULIC TESTS  
AT

QUENCH VALVE

c. **Installation.** Install the quench thermal expansion valve (fig. 5-10) as follows:

(1) Solder valve to tubing.

(2) Install mounting brackets and two screws, spacers and self-locking nuts.

(3) Insert approximately one ounce of thermal mastic in bulb well. Insert sensing bulb of expansion valve and move bulb back and forth to distribute mastic and set bulb approximately one inch beyond open end.

(4) Install housing rear top cover (figure 4-5).

(5) Refer to figure 6-2 and charge the refrigerant system.

### 5-30. Pressure Regulator Valve.

a. **Removal.** Refer to figure 6-1 and discharge the refrigerant system. Remove housing top covers

(figure 4-5). Refer to figure 5-10 and remove screw, lockwasher, loop clamp and spacer. Unsolder pressure regulator from tubing.

b. **Installation.** Solder pressure regulator valve (figure 5-10) on tubing and install loop clamp, spacer, screw and lockwasher. Install housing covers (figure 4-5). Refer to figure 6-2 and charge the refrigerant system.

### 5-31. Motors.

Refer to paragraph 4-38 for removal and installation of motors.

### 5-32. Control Module.

Refer to paragraph 4-42 for removal and installation of control module.

# CHAPTER 6

## REPAIR INSTRUCTIONS

### Section I. REFRIGERATION SYSTEM

#### 1. General

The refrigerant system illustrated by the refrigerant flow diagram (fig. 5-1), is a mechanical, vapor cycle type circuit consisting of the evaporator, thermal expansion valve, motor-compressor, condenser, and the necessary valves and cutout devices for automatic control during operation. The thermal expansion valve releases high-pressure liquid refrigerant into the evaporator at reduced pressure. The liquid refrigerant begins to vaporize by absorbing heat from the air passing over the external surface of the evaporator coil. The heated vapor is sucked out of the evaporator section by the motor-compressor and forced into the condenser section under high pressure where it is cooled and condensed back to a liquid. The heat released during condensation is carried off by the condensing air stream. The liquid refrigerant flows from the condenser to a receiver, to a subcooler, and then to the thermal expansion valve. If the temperature control switch (evaporator return air thermostat) becomes satisfied, or the evaporator return air temperature is lower than the control switch set point, the refrigerant system will switch to a by-pass condition. The temperature control switch will activate the normally-open liquid bypass solenoid valve, closing the valve, and therefore shutting off the evaporator section of the unit. The motor-compressor will continue to pump as usual and the suction pressure will begin to drop. When it reaches approximately 65 psig (450 kPa), the pressure regulating valve will start to open in an effort to maintain the suction pressure above 55 psig (380 kPa) (approximately). As the suction temperature increases, due to the pressure regulating valve opening, the quench expansion valve will start to meter liquid refrigerant to the suction line in an effort to maintain the suction temperature below 75°F (24°C) (approx.) or

tally automatic and also may occur at extreme conditions in an attempt to maintain the suction pressures (even during the cooling mode) at a condition above 55 psig (380 kPa) and the suction temperatures (measured at the quench bulb well) below 75°F (24°C). The condenser louvers are operated by a refrigerant powered piston located in the high pressure part of the system. This piston should be fully extended (louvers open 80°F (27°C) (approx.) at 165 psig (1140 kPa) head pressure and fully closed at 165 psig (1140 kPa). Failure to perform this function could result in icing of the evaporator coil and/or cutout on the low pressure cutout.

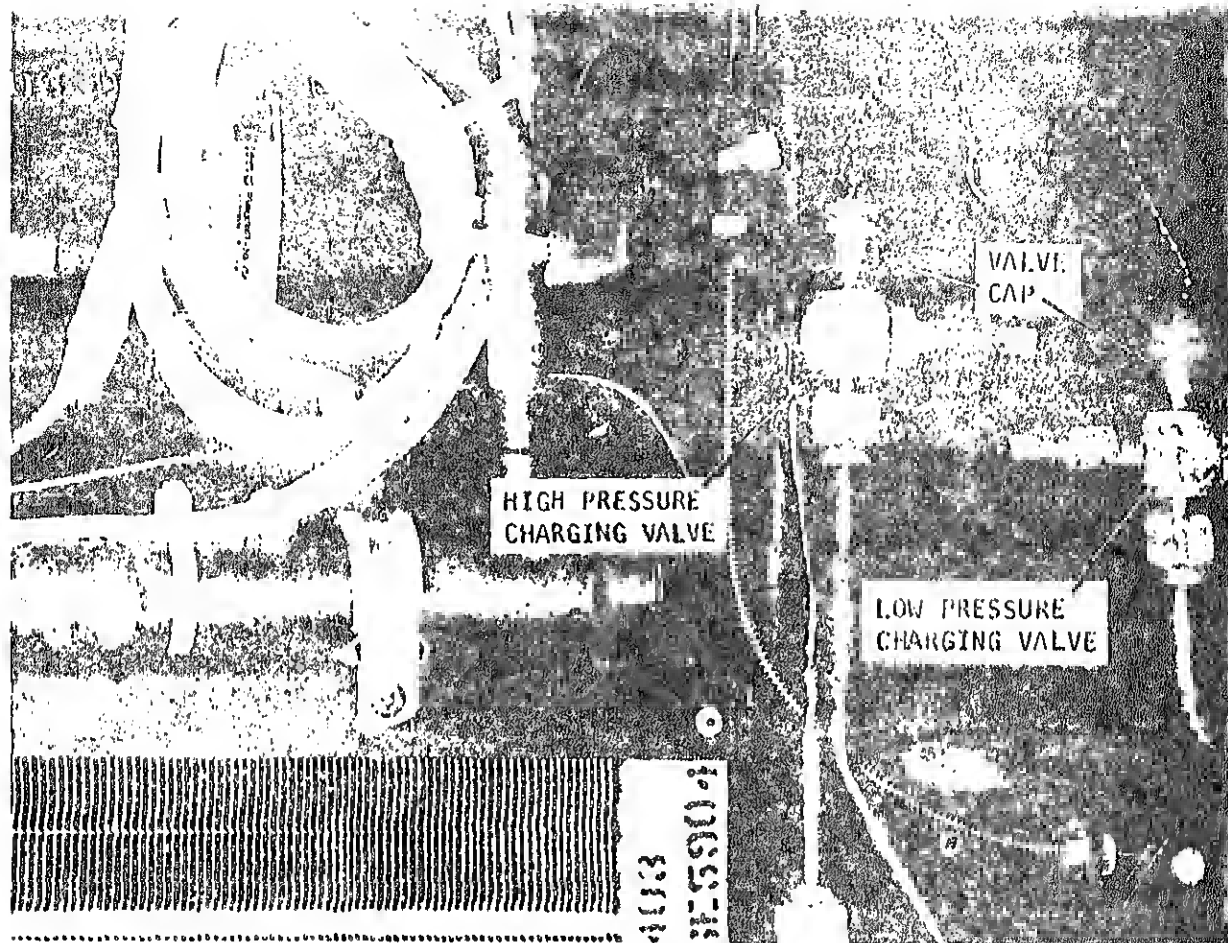
#### 6-2. Pressure Testing the Refrigerant System

*a. General.* A pressure test will indicate whether the air conditioner is operating at normal or at abnormal pressures. When the air conditioner is not operating at normal pressures the cause should be ascertained and corrected. Refer to table 5-1 for troubleshooting chart.

*b. System Pressure Test.* Remove caps from high and low pressure service valves (fig. 5-7), connect suction and discharge pressure gages to the respective service valves. Compare the gage readings with the normal range of system pressure shown in table 6-1.

#### 6-3. Servicing Refrigerant System

*a. General.* When the air conditioner must undergo maintenance that requires opening the system, the system must be discharged prior to maintenance, then purged, a new dehydrator installed, the system charged after maintenance. Basic procedures involved in servicing the refrigerant system are as follows:



TS 4120-352-14/6-1

TO DISCHARGE SYSTEM:  
REMOVE ACCESS COVER.  
REMOVE LOW PRESSURE CHARGING VALVE  
CAP. ATTACH A SUITABLE HOSE TO  
CHARGING VALVE AND DISCHARGE  
REFRIGERANT INTO A SAFE AREA.

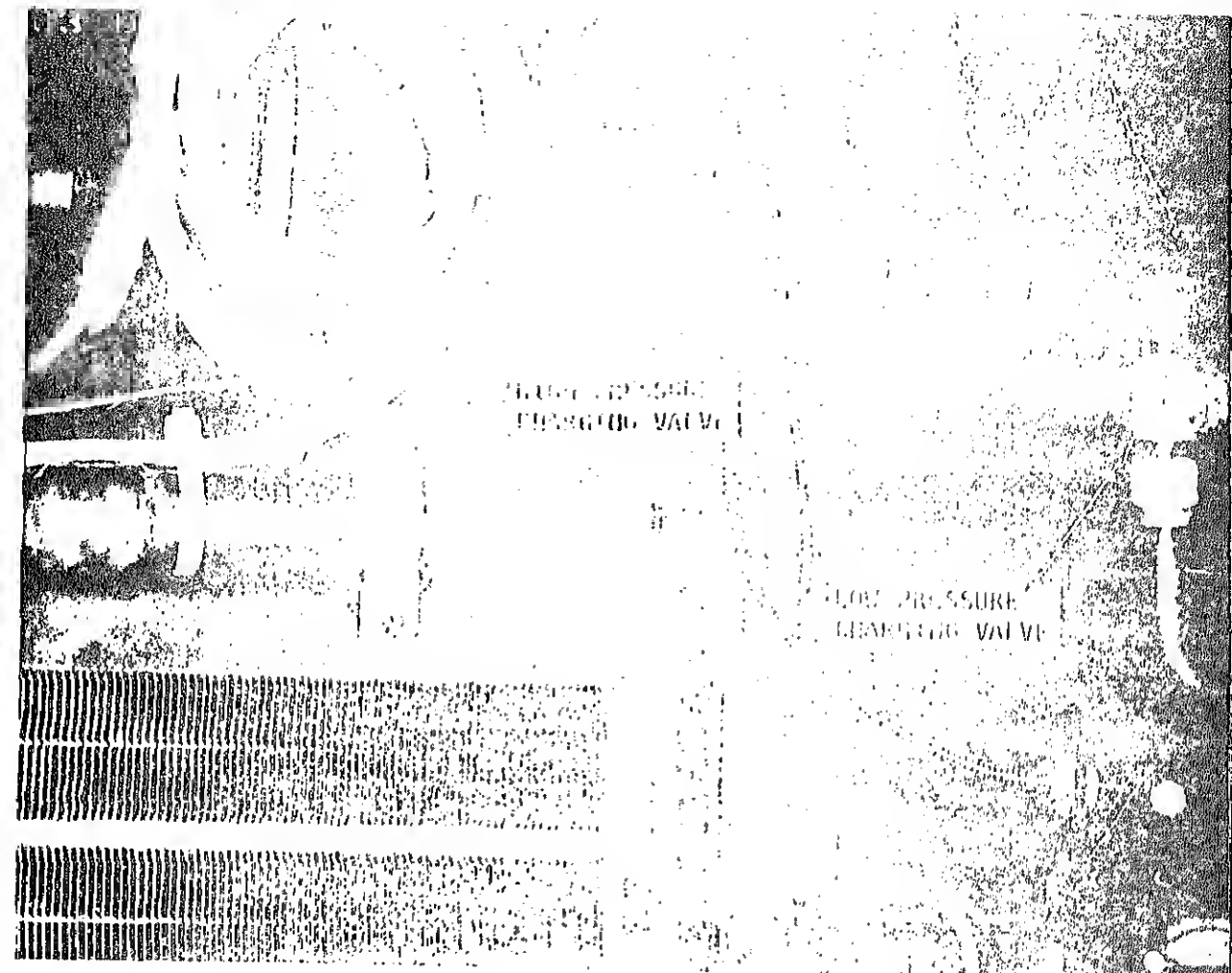
NOTE:  
TO PREVENT EXCESS LOSS OF OIL,  
DISCHARGE SYSTEM SLOWLY OVER A

TO PURGE SYSTEM:  
REMOVE HIGH PRESSURE CHARGING VALVE CAP.  
CONNECT VALVE TO A CYLINDER OF DRY NITROGEN  
ATTACH A SUITABLE DISCHARGE HOSE TO  
LOW PRESSURE CHARGING VALVE.  
OPEN NITROGEN VALVE AND ALLOW NITROGEN TO  
FLOW THROUGH SYSTEM UNTIL ALL MOISTURE IS  
FORCED OUT. CLOSE NITROGEN CYLINDER VALVE.  
CONNECT A VACUUM PUMP TO HIGH AND LOW  
PRESSURE CHARGING VALVES AND HOLD A

**Table 6-1. Normal Operating Pressures**

<i>Outdoor Ambient Temperature</i>				
	<i>60°F (10°C)</i>	<i>76°F (24°C)</i>	<i>100°F (38°C)</i>	<i>120°F (49°C)</i>
<i>At 90°F (32°C) DB return air to unit</i>				
suction pressure	58-85 psi (400-450 kPa)	58-70 psi (400-485 kPa)	80-75 psi (255-295 kPa)	75-90 psi (515-620 kPa)
charge pressure	125-180 psi (880-1100 kPa)	175-210 psi (1200-1450 kPa)	255-295 psi (1750-2025 kPa)	370-410 psi (2550-2825 kPa)
<i>At 80°F (27°C) DB return air to unit</i>				
suction pressure	58-85 psi (400-450 kPa)	58-70 psi (400-485 kPa)	80-75 psi (415-515 kPa)	65-75 psi (450-515 kPa)
charge pressure	120-155 psi (825-1070 kPa)	170-205 psi (1170-1415 kPa)	250-290 psi (1725-2000 kPa)	370-410 psi (2550-2825 kPa)

***Charging the System.*** Refer to figure 6-2 for instructions on charging the system with refrigerant.



HIGH PRESSURE  
CHARGING VALVE

LOW PRESSURE  
RECHARGING VALVE

TS 4120 352-14/6-2(1)

NOTE: STEPS 1, 2 AND 3 APPLY ONLY TO A  
COMPLETELY EVACUATED SYSTEM.  
TO ADD ADDITIONAL REFRIGERANT TO A  
CHARGED SYSTEM, REFER TO STEPS 6 THRU 9.

STEP 1. REMOVE ACCESS COVER.  
REMOVE HIGH PRESSURE CHARGING VALVE CAP AND  
LOOSELY CONNECT CHARGING LINE OF DRUM TO VALVE.

STEP 2. OPEN REFRIGERANT DRUM VALVE SLIGHTLY  
TO PURGE AIR FROM CHARGING LINE.

STEP 3. SET THE REFRIGERANT DRUM IN AN INVERTED POSITION ON A SCALE. DO NOT OPERATE THE AIR CONDITIONER. OPEN CHARGING LINE VALVE AND CHARGING VALVE AND CHARGE REFRIGERANT SYSTEM UNTIL SYSTEM AND DRUM PRESSURES HAVE EQUALIZED, OR UNTIL 2.1 POUNDS OF REFRIGERANT HAVE ENTERED THE SYSTEM.

STEP 4. CLOSE VALVES AND CAREFULLY LOOSEN THE CHARGING LINE TO RELEASE TRAPPED PRESSURE. DISCONNECT CHARGING LINE AND INSTALL CHARGING VALVE CAP. OPERATE AIR CONDITIONER IN COOLING MODE FOR 15 MINUTES.

STEP 5. CHECK LIQUID SIGHT INDICATOR. IF SYSTEM IS SHORT OF REFRIGERANT, GAS BUBBLES WILL APPEAR REGULARLY IN THE INDICATOR. IF REFRIGERANT SYSTEM IS UNDERCHARGED, ADD ADDITIONAL REFRIGERANT, FOLLOWING STEPS 6 THROUGH 9.

STEP 6. USING SAME DRUM AND CHARGING LINE, PLACE DRUM IN AN UPRIGHT POSITION ON A SCALE. REMOVE CAP FROM LOW PRESSURE (SUCTION SIDE) CHARGING VALVE, AND LOOSELY CONNECT CHARGING LINE TO VALVE. PURGE AIR FROM LINE AS IN STEP 2.

CAUTION: WHEN ADDING REFRIGERANT, USE EXTREME CARE TO AVOID ADDING REFRIGERANT TO THE SYSTEM TOO FAST, WHICH WOULD CAUSE SLUGGING AT THE COMPRESSOR.

STEP 7. WITH THE AIR CONDITIONER OPERATING, ADMIT GAS TO SYSTEM SLOWLY (APPROXIMATELY 1 OUNCE PER MINUTE). CONSTANTLY OBSERVE DRUM WEIGHT TO INSURE THAT ONLY 2.1 POUNDS TOTAL WEIGHT OF REFRIGERANT IS IN SYSTEM.

STEP 8. REPEAT STEP 4.

STEP 9. CHECK LIQUID SIGHT INDICATOR. IF INDICATOR REGULARLY SHOWS BUBBLES, REPEAT STEPS 6 THROUGH 9, ADDING REFRIGERANT IN 4 OUNCE INCREMENTS UNTIL INDICATOR IS CLEAR.

STEP 10. REPLACE ACCESS COVER.



#### 6-4. Repairing Refrigerant Leaks

- a. Locate leak (para 4-52).
- b. Discharge system (figure 6-1), repair leak, and recharge system (para 6-3).

#### NOTE

If soldering is necessary on any part of the system, a constant purge of dry nitrogen must be fed through the system being soldered to prevent scale formation within the system.

### 6-5. Decontamination

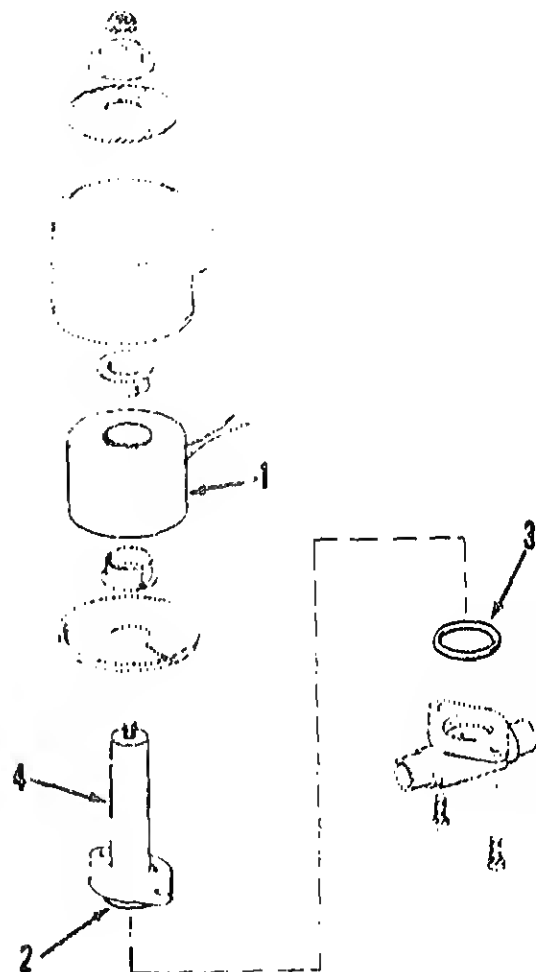
a. *General.* The compressor is a hermetically sealed unit and cannot be repaired. An inoperative compressor is usually due to a mechanical failure or motor burnout. If the compressor is mechanically frozen or sustains a motor burnout, it must be replaced. A compressor failure generates high temperature causing a breakdown of oil, refrigerant and motor insulation, with the resulting formation of acid, moisture, sludge. The products are extremely corrosive and must be flushed from the system or repeated burnouts will occur.

#### b. Procedure.

- (1) Discharge system and purge with nitrogen (figure 6-1).
- (2) Remove defective motor-compressor (para 5-17).
- (3) Remove dehydrator (para 5-24).
- (4) With compressor out of system, purge all lines with dry nitrogen.
- (5) Install a new compressor (para 5-17) containing a full and proper oil charge.
- (6) Install new dehydrator (para 5-24). In step 10 this dehydrator will again be replaced.
- (7) Triple evacuate system and charge with refrigerant R22.
- (8) Start air conditioner (para 2-10) and operate unit for 24 hours.
- (9) Discharge system and purge with nitrogen (para 6-3).
- (10) Install new dehydrator (para 5-24).
- (11) Evacuate system and recharge with refrigerant (para 6-3).
- (12) Operate air conditioner.

#### 6-4. Recharge Parts

a. *General.* Replaceable parts are the coil, net assembly, diaphragm and the preformed packing. See figure 6-3.



TS 4120-352-14/6.

1. Coil
2. Diaphragm
3. Preformed packing
4. Bonnet assembly

### 6-6. Evaporator and Condenser Coils

**b. Coil Replacement.** Replace coil as follows:

(1) Remove electrical connector from solenoid valve leads.

(2) Remove nut on top of valve housing. Lift housing and coil assembly from bonnet assembly.

(3) Remove coil from housing.

(4) Install coil bottom plate with edge upward.

(5) Install lower coil sleeve with flange at bottom. Install coil with lead exits and bottom.

(6) Install coil spring with flat edges upward and upper coil sleeve with flange at top. Sleeve passes through the coil spring.

(7) Install coil housing, data plate and nut.

**c. Bonnet Assembly and Diaphragm Replacement.** Replace parts as follows:

(1) To replace diaphragm (2, figure 6-3), remove two screws from body flanges and lift housing, coil and bonnet assembly (4) from body. Lift out diaphragm.

(2) To replace bonnet assembly, remove coil housing and coil (b above) from bonnet assembly.

(3) Assemble coil and bonnet assembly. Install diaphragm and preformed packing (3) on body. In-

stall coil and bonnet assembly and secure with two screws.

## 6-8. Fan Motors.

**a. General.** The condenser fan motor and evaporator fan motor are identical. Therefore, the following instructions apply equally to either motor.

**b. Disassembly.** Refer to figure 6-4 and disassemble motor as follows:

(1) Remove four hex nuts (1), four through bolts (2), and eight flat washers (3). Remove rear end bell (4).

(2) Pull out rotor (9) and remove shims (5) and (6), bearing spacers (7) and bearings (8).

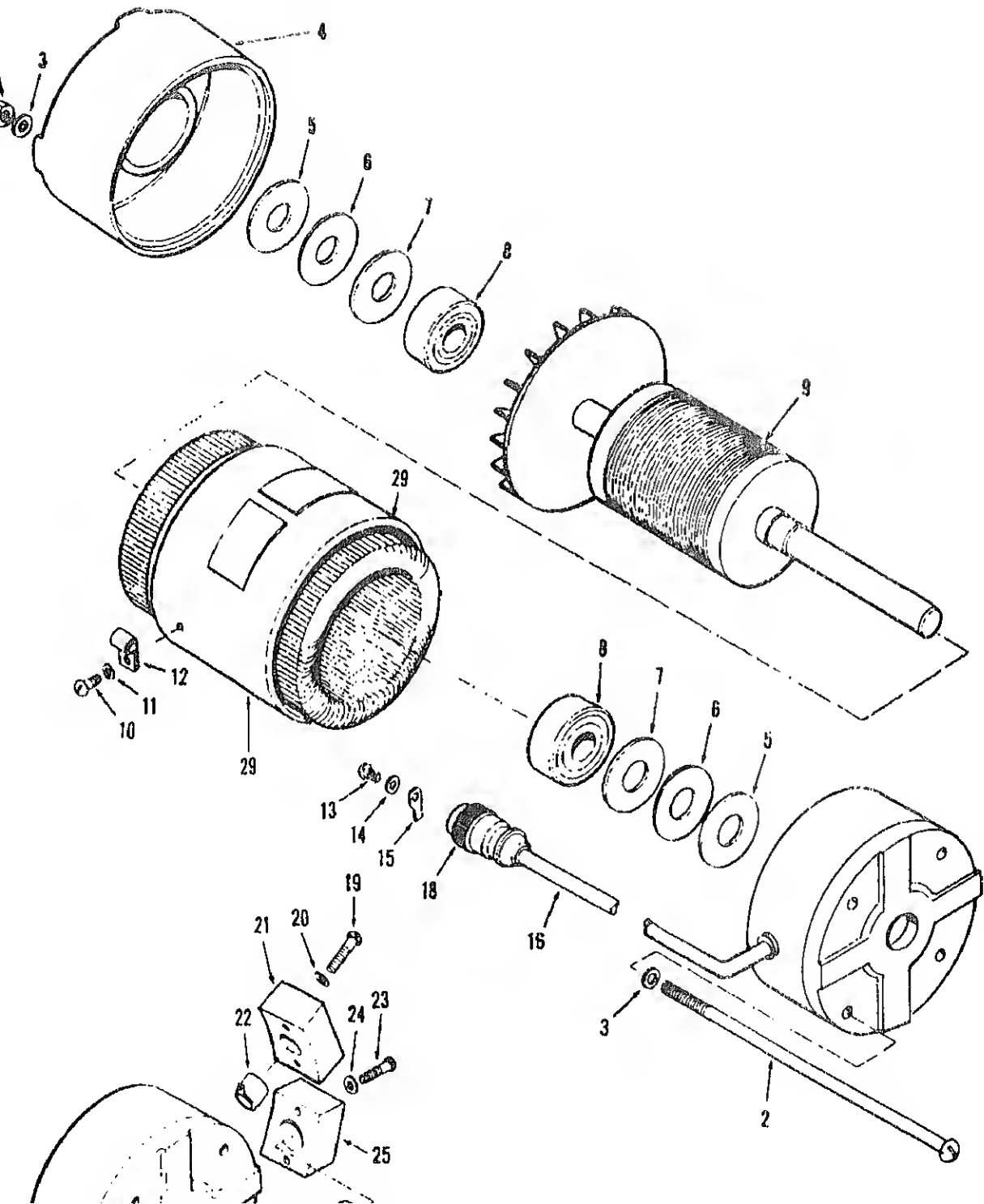
(3) Remove screw (10), washer (11), and loop clamp (12). Remove screw (13), washer (14), and ground terminal (15). Disconnect leads and remove cable (16) and strain relief bushing (17). Remove connector.

(4) Refer to paragraph 4-39 and remove thermal protector housings (21) and (25), thermal protectors (22) and (26), and attaching hardware. Remove front end bell (27) from stator (28).

Index, Figure 6-4. Fan motor, exploded view.

1. NUT, HEX  
2. BOLT, THROUGH  
3. WASHER, FLAT  
4. END BELL, REAR  
5. SHIM  
6. SHIM  
7. SPACER, BEARING  
8. BEARING, BALL, ANNULAR  
9. ROTOR  
10. SCREW  
11. WASHER  
12. CLAMP, LOOP  
13. SCREW  
14. WASHER

15. TERMINAL  
16. CABLE  
17. BUSHING, STRAIN RELIEF  
18. CONNECTOR  
19. SCREW  
20. WASHER  
21. HOUSING, THERMAL PROTECTOR  
22. THERMAL PROTECTOR  
23. SCREW  
24. WASHER  
25. HOUSING, THERMAL PROTECTOR  
26. THERMAL PROTECTOR  
27. END BELL, FRONT  
28. STATOR



c. **Cleaning, Inspection and Repair.** Clean, inspect and repair parts as follows:

**WARNING**

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138°F (38° - 59°C).

(1) Clean metal parts with cleaning solvent (Fed. Spec. P-D-680). Wipe off electrical parts with clean cloth.

(2) Inspect wiring for damaged insulation and broken wiring. Repair damaged insulation.

(3) Inspect connector for damage.

(4) Inspect bearing for wear, galling or flat spots. Replace defective bearings.

(5) Inspect shaft for gouges or worn bearing surface. Repair minor defects.

(6) Inspect stator for damaged, broken or distorted wiring.

d. **Assembly.** Refer to figure 6-4 and assemble motor as follows:

(1) Install thermal protectors (22) and (26) and housings (21) and (25) in front end bell (28) as described in paragraph 4-39.

(2) Install connector (18) on cable (16). Install cable and strain relief bushing (17) in end bell. Partially install end bell on stator and connect terminal (15), with screw (13) and washer (14). Make electrical connections.

(3) Install shims (5) and (6), bearing spacer (7), bearings (8), and rotor (9).

(4) Install rear end bell (4). Place a washer (3) on each through bolt (2). Install through bolts in motor and secure each with a nut (1) and washer (3).

(5) Install loop clamp (12) on cable and secure clamp (12) on cable and secure clamp to stator frame with screw (10) and washer (11).

## 6-9. Control Module.

a. **General.** This paragraph covers repair of control module. Testing, removal, and installation of switches and circuit breaker are covered in paragraphs 4-45 through 4-47. Parts of the control module are shown in figure 6-5.

b. **Disassembly.** Refer to figure 6-5 and disassemble the control module as follows:

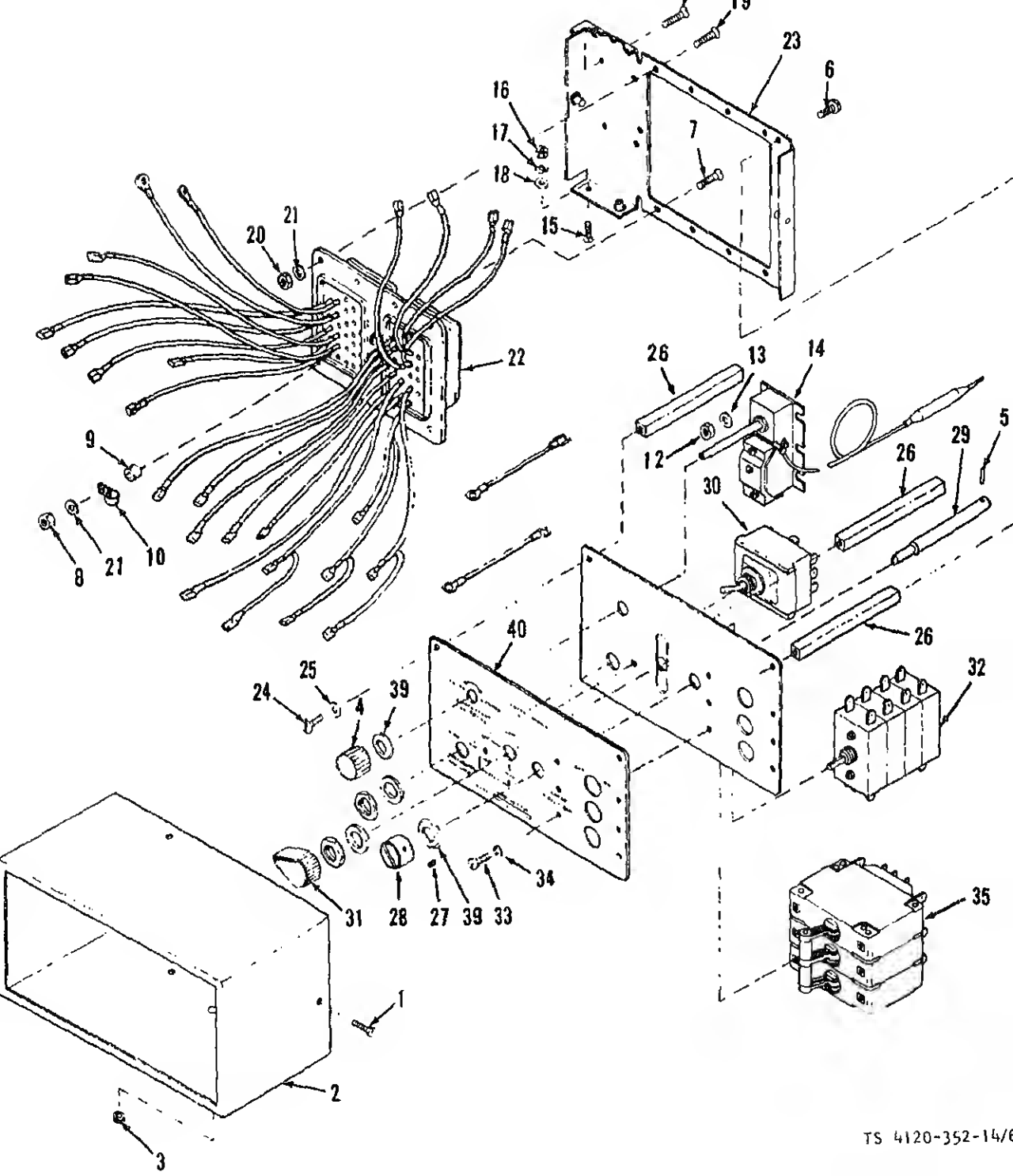
(1) Remove four screws (1) and split grommet (3). Slide cover (2) from module and pull capacitor tube and bulb through opening in bottom of cover.

(2) Remove knob (4). Drive out roll pin

Index, Figure 6-6. Control module, exploded view

1. SCREW, FLAT CSK-HD, 4-40 x 7/16
2. COVER
3. GROMMET, SPLIT
4. KNOB
5. ROLL PIN
6. SCREW, SELF-LKG, FLAT-HD, 6-32x5/16
7. SCREW, FLAT CSK-HD, 6-32 x 7/8
8. NUT, HEX, SELF-LKG, 6-32
9. POST, SPACER
10. LOOP CLAMP
11. SCREW, FLAT CSK-HD, 6-32 x 7/16
12. NUT, HEX, SELF-LKG, 6-32
13. WASHER, FLAT, NO. 6
14. SWITCH, TEMPERATURE CONTROL

20. NUT
21. WASHER, FLAT, NO. 6
22. CONNECTOR ASSEMBLY
23. MOUNTING FRAME
24. SCREW, SELF-LKG, PAN-HD, 6-32x5/16
25. WASHER, FLAT, NO. 6
26. POST
27. SETSCREW, HEX-SOC, 4-48 x 1/8
28. KNOB
29. JACKSCREW EXTENSION
30. SWITCH, TOGGLE
31. KNOB
32. ROTARY SWITCH, MODE SELECTOR
33. SCREW, SELF-LKG, PAN-HD, 6-32 x 5/16



(3) Disconnect leads. Remove three self-locking screws (6) and remove rear mounting frame (23) with connector and temperature control switch attached.

(4) Remove connector mounting screw (7), nut (8), loop clamp (10), washer (21) and spacer post (9) to release temperature control capillary tube.

(5) Remove four screws (11), nuts (12), and flat washers (13) and remove temperature control switch (14).

(6) Remove screw (15), nut (16), lock washer (17) and two flat washers (18) and disconnect ground lead.

(7) Remove seven remaining screws (19), nuts (20) and washers (21) and remove connector assembly (22) from mounting frame (23). Do not remove leads from connector unless they require replacement.

(8) Remove three screws (24), washers (25) and posts (26).

(9) Remove setscrew (27), knob (28), and jack-screw extension (29).

(10) Remove toggle switch (30) by removing knut and washer.

(11) Remove mode selector knob (31), switch nut and washer and remove mode selector rotary switch (32).

(12) Disassemble handle of three phase circuit breaker (35). Remove six screws (33) and washers (34) securing three phase circuit breaker (35) to mounting plate (36). Remove circuit breaker.

(13) Remove grommets (37) and designation plate (38) from mounting plate.

### **WARNING**

**Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138°F (38° - 59°C).**

### **c. Cleaning, Inspection and Repair.**

(1) Clean metal parts with cleaning solvent (Fed. Spec. P-D-680). Wipe off electrical parts with a clean cloth.

(2) Refer to paragraph 4-45 and test switch and circuit breaker. Replace defective parts.

(3) Inspect connector for damaged casing, bent or broken contacts. Check wiring for damaged insulation and broken wires. Check terminals for damage. Repair damaged wiring. Replace connector if defective.

(4) Check cover, frame and plates for good condition. Straighten bent parts or replace parts if required.

**d. Assembly.** Refer to figure 6-5 and assemble control module as follows:

(1) Place designation plate (38) on mounting plate (36) and install circuit breaker (35) with screws (33) and washers (34). Install grommets (37).

(2) Install rotary switch (32) and secure with switch nut and washer. Install knob (31).

(3) Install toggle switch (30) and secure with switch nut and washer.

(4) Insert jack-screw extension (29) through opening in mounting plate and install knob (28) with setscrew (27).

(5) Install connector assembly (22) on mounting frame (23) and secure with seven screws (19), nuts (20), and washers (21). Omit screw (7) in lower corner.

(6) Install screw (15), washers (18) and lock washer (17) and nut (16) with ground terminal between the two flat washers (18).

(7) Install temperature control switch (14) on frame and secure switch with four screws (11), nuts (12), and flat washers (13). Install loop clamp on capillary tube and install screw (7), spacer post (9), washer (21), clamp and nut (8).

(8) Assemble three posts (26) to front plate with screws (24) and washers (25). Position plate against frame and install screws (6). Install roller (5).

(9) Pass capillary tube through opening in bottom of cover (2) and install cover on module with grommet (3) and four screws (1).

# APPENDIX A

## REFERENCES

---

### **Fire Protection**

TB 5-4200-200-10

*Hand Portable Fire Extinguisher for Army Users*

### **Lubrication**

C91001L

*Fuels, Lubricants, Oils and Waxes*

### **Painting**

TM 9-213

*Painting Instructions for Field Use*

### **Maintenance**

TM 38-750

*Army Maintenance Management System*

TM 750-244-3

*Procedures for Destruction of Equipment to Prevent Enemy Use*

Fed. Spec. P-D-680

*Dry Cleaning Solvent*

### **Shipment and Storage**

TM 740-90-1

*Administration Storage of Equipment*

# APPENDIX B

## MAINTENANCE ALLOCATION CHART

### Section I. MAINTENANCE ALLOCATION CHART

#### General

a. This section provides a general explanation of maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for performance of maintenance functions on the identified end item or component and the work measurement time required to perform the functions by the designated maintenance level. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the tools and test equipment required for each maintenance function as referred from Section II.

#### Explanation of Columns in Section II

a. *Column 1, Group Number.* Column 1 lists group number to identify related components, assemblies, subassemblies, and modules with their next higher assembly. The applicable groups are listed in the MAC in disassembly sequence beginning with the first group removed.

b. *Column 2, Component/Assembly.* This column contains the noun names of components, assemblies, subassemblies and modules for which maintenance is authorized.

c. *Column 3, Maintenance Functions.* This column lists the functions to be performed on the item listed in Column 2. The maintenance functions are defined as follows:

(1) **Inspect.** To determine serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

(2) **Test.** To verify serviceability and detect

limits, by bringing into proper or exact position by setting the operating characteristics to specified parameters.

(5) **Align.** To adjust specified variable elements of an item to bring about optimum or desired performance.

(6) **Calibrate.** To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust discrepancy in the accuracy of the instrument being compared.

(7) **Install.** The act of emplacing, seating, or fixing into position an item, part or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

(8) **Replace.** The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

(9) **Repair.** The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facemachining or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item or system.

(10) **Overhaul.** That maintenance (service/action) necessary to restore an item to completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return



*d. Column 4, Maintenance Category.* This column is made up of sub-columns for each category of maintenance. Work time figures are listed in these sub-columns for the lowest level of maintenance authorized to perform the function listed in Column 3. These figures indicate the average active time required to perform the maintenance function at the indicated category of maintenance under typical field operating conditions.

*e. Column 5, Tools and Equipment.* This column is provided for referencing by code, the common tool sets (not individual tools) special tools, test and support equipment required to perform the designated function.

### **3.      Explantation of Columns in Section III**

*a. Column 1. Reference Code.* This column consists of an arabic number listed in sequence from

common tool sets, special tools and test equipment requirements.

*b. Column 2. Maintenance Category.* This column shows the lowest category of maintenance authorized to use the special tools or test equipment.

*c. Column 3. Nomenclature.* This column shows the name or identification of the common tool sets, special tools or test equipment.

*d. Column 4. National/NATO Stock Number (NSN).* This column is provided for the NSN of common tool sets, special tools and test equipment listed in the nomenclature column.

*e. Column 5. Tool Number.* This column shows the manufacturer's code and part number of the tool sets, special tools and test equipment.

## Section II. MAINTENANCE ALLOCATION CHART

### 9000 BTU/HR Air Conditioner, Compact, Horizontal

(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(4) Tools & Equipment	(6) Remarks
		C	O	F	H	D		
FRAME & CASING								
Panels	Repair		1.0					
	Replace		0.2					
Louvers	Repair		1.0				1	
	Replace		0.2					
Canvas Cover	Replace		1.0					
ELECTRICAL COMPONENTS								
Transformer	Test		0.3					
	Replace		1.0					
Resistor	Test		0.3					
	Replace		1.0					
Rectifier	Test		0.3				1	
	Replace		1.0					
Control Module	Test		0.3					
	Repair			2.0				
	Replace		1.0					
Switches	Test		0.3					
	Replace		1.0					
STARTING & PROTECTING DEVICES								
Capacitor	Test		0.3					
	Replace		1.0					
Relays	Test		0.3					
	Replace		1.0					
Pressure Switches	Test		0.3					
	Replace			4.0			1	
Overload Protector	Test		0.3					
	Replace		1.0					
Circuit Breakers	Test		0.3					
	Replace		1.0					
WIRING								
Wiring Harness	Inspect	0.5					1	

# Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools & Equipment	Re
			C	O	F	H	D		
06	ELECTRICAL MOTOR Condenser Motor	Test	0.2						
		Repair			1.0				
		Replace		2.0					
	Bearings	Replace			2.0				
	Condenser Fan	Inspect	0.2						
		Repair		1.0					
		Replace		1.0					
	Evaporator Motor	Test	0.2					1	
		Repair			4.0				
		Replace		2.0					
	Bearings	Replace			4.0				
07	REFRIGERATION COMPONENTS Compressor	Inspect	0.2						
		Cleann	0.4						
		Replace			4.0				
	Piping	Test	0.3						
		Repair		1.0					
		Replace				8.0			
	Valve Solenoid	Test	1.0					1	
		Repair			4.0				
		Replace				4.0			
	Dehydrator	Test	0.2						
		Replace			4.0				
	Valve Expansion	Replace			4.0				
	Condenser Coil	Test		1.0				1	
		Repair			6.0				
		Replace				8.0			
	Evaporator Coil	Test		1.0					
		Repair			6.0				
		Replace				8.0			
08	HEATING ELEMENTS Elements	Repair	1.0					1	
		Replace		2.0					

# APPENDIX C

## BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST

### Section I. INTRODUCTION

#### 1. Scope

This appendix lists items which accompany the air conditioner or are required for installation, operation, or operator's maintenance.

#### 2. General

This Basic Issue Items List is divided into the following sections:

*a. Basic Issue Items - Section II.* A list of items which accompany the air conditioner and are required by the crew-operator for installation, operation, or maintenance.

*b. Maintenance and Operating Supplies - Section III.* A list of items of tools and test equipment.

#### 3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

*a. Source, Maintenance, and Recoverability Codes (SMR):*

(1) Source code, indicates the source for the listed item. Source codes are:

Code	Explanation
P	Repair Parts, Special Tools and Test Equipment supplied from the GSA/DSA, or Army supply system and authorized for use as indicated maintenance categories.
P2	Repair Parts, Special Tools and Test Equipment which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
M	Repair Parts, Special Tools and Test Equipment

X Parts and assemblies that are not procured or stocked because the failure rate is normally higher than that of the applicable end item or component. Failure of such part or assembly should result in retirement of the end item from the supply system.

X1 Repair parts which are not procured or stocked because the requirement for such items will be filled by the next higher assembly or component.

X2 Repair parts, Special Tools and Test Equipment which are not stocked and have not foreseen availability. The indicated maintenance category requiring such repair parts will attempt to obtain parts through cannibalization or salvage, then may be requisitioned with exception data, from the end item manager, for immediate use.

G Major assemblies that are procured with P funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will be stocked above DS and GS level or returned to the supply level.

(2) Maintenance code, indicates the level or category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
R	Applied to repair parts, (assemblies and components) special tools and test equipment which are considered economically repairable at direct support maintenance levels. When the item is no longer economically repairable, it is normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot repair as set forth in AR 710-60. When so listed they will be replaced by supply on an exchange basis.

cial handling and are issued on an exchange basis. Such items will be repaired or overhauled at depot maintenance activities only. No repair may be accomplished at lower levels.

U Repair parts, special tools and test equipment specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value or reusable casings or castings.

*b. National Stock Number.* This column indicates the National Stock Number assigned to the item and will be used for requisitioning purposes.

*c. Description.* This column indicates the National item name and any additional description of the item required. The abbreviation "w/e", when used as part of the nomenclature, indicates the National Stock Number, includes all armament, equipment, accessories, and repair parts issued with the item. A part number or other reference number is followed by the applicable five-digit National Sup-

ply Code for manufacturers in parenthesis. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

*d. Unit of Measure (U/M).* A two-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

*e. Quantity Incorporated in Unit.* This column indicates the quantity of the item in the assembly group. A "V" appearing in this column in lieu of a quantity indicates that a definite quantity cannot be indicated (e.g., shims, spacers, etc.).

*f. Quantity Furnished With Equipment.* This column indicates the quantity of an item furnished with the equipment.

*g. Illustration.* This column is divided as follows:

(1) **Figure Number.** Indicates the figure number of the illustration in which the item is shown.

(2) **Item Number.** Indicates the callout number used to reference the item in the illustration.

## Section II. BASIC ISSUE ITEMS

(1) SMR CODE	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QTY FURN WITH EQUIP	(6) ILLUSTRATION (A) FIG. NO.
		Group 31 Basic Issue Items Manufacturer Installed			
PO	5220-00-559-9618	Case: Maintenance and operation manual, cotton duck, water repellent mildew resistant, MIL-B-11743B.	ea	1	

## Section III. TOOLS AND TEST EQUIPMENT REQUIREMENTS

(1) REF CODE	(2) MAINT CATEG.	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
--------------------	------------------------	---------------------	------------------------------------	-----------------------

# ALPHABETICAL INDEX

ment:		
enser Louver Control.....	5-20	5-13
h Air Damper.....	4-19	4-10
istrative Storage.....	1-6	1-1
iter.....	4-17	4-8

## B

g.....	5-6	5-6
--------	-----	-----

## C

tors:		
acement.....	4-15	4-6
l. Suppression.....	4-14	4-6
ng Valves.....	5-22	5-18
Breaker:		
ation, Removal and Testing.....	4-42	4-33
essor:		
ral.....	5-17a	5-7
ection.....	4-49	4-42
llation.....	5-17c	5-9
oval.....	5-17b	5-7
ng and Repair.....	4-49	4-42
essor Motor Relay:		
llation, Removal and Testing.....	4-43	4-36
ser Coil:		
ection and Replacement.....	6-6	6-6
cing.....	4-23	4-16
ser Fan Motor Switch.....	4-40	4-31
ser Guard and Louver:.....	4-20	4-12
ser Louver Actuator and Control.....	6-20	6-13
Circuit Breaker.....	4-42	4-33
Module:		
ral.....	4-42	4-33
llation, Removal, Repair and Testing.....	6-9	6-9
s and Instruments.....	2-6	2-4
Operation.....	2-6	2-8
Housing.....	4-21	4-14

## D

Preventive Maintenance Services.....	3-4	3-1
ator:		
llation and Removal.....	6-24	6-18
tion:		
Conditioner.....	1-8	1-4
eration System.....	6-1	6-1
ction to Prevent Enemy Use.....	1-5	1-1
nces Between Models.....	1-7	1-1
ator's Maintenance.....	3-9	3-3
	4-25	4-16

# ALPHABETICAL INDEX (Cont)

	Paragraph	Page
Installation, Removal and Testing.....	4-39	4-3
Expansion Valves:		
Replacement, Thermal Expansion Valve .....	5-28	5-2
Replacement, Quench Valve.....	5-29	5-2

## F

Fan Motors:		
Removal and Installation.....	4-38	4-2
Disassembly and Reassembly.....	6-8	6-7
Filter, Return Air; Servicing.....	4-17	4-8
Fresh Air Screen; Replacement.....	4-19	4-1
Fresh Air Vent Damper:		
Adjustment.....	4-27	4-1
Cleaning, Inspection and Repair.....	4-29	4-2
Installation.....	4-30	4-2
Removal.....	4-28	4-2

## G

Gaskets.....	5-8	5-6
--------------	-----	-----

## H

Hardware.....	5-9	5-6
Heater Elements.....	4-35	4-2
Heater Relay:		
Installation, Removal and Testing.....	4-43	4-3
Heater Thermostatic Switch.....	4-34	4-2
Heating Operation.....	2-8	2-8
High Pressure Cutout Switch:		
Replacement and Testing.....	4-47	4-4
Housing Covers.....	4-21	4-1

## I

Identification.....	1-9	1-6
Inspecting Equipment:		
Operator's Inspection.....	2-3	2-1
Organizational Inspection.....	4-2	4-1
Installation.....	4-3	4-1
Insulation.....	5-8	5-1

## J

Junction Box:		
Assembly, Disassembly, Installation, Removal, and Testing.....	4-43	4-3

## L

Liquid Sight Indicator:		
Operator's Maintenance.....	3-10	3-3
Replacement.....	5-26	5-2
Louver Control Actuator:		
Control Adjustment.....	4-20	4-1
Louvers:		
Condenser.....	4-20	4-1
Evaporator.....	4-18	4-1
Operator's Maintenance.....	4-16	4-1

# ALPHABETICAL INDEX (Cont)

## M

Maintenance Repair Parts:		
Direct Support.....	5-3	5-1
Indicator's.....	4-6	4-1
Selector Switch:		
Installation, Removal and Testing.....	4-42	4-1
Numbers.....	1-9	1-6
Overhaul and Installation.....	4-38	4-25
Pressure Protector Replacement.....	4-38	4-25
Thermistor:		
Testing.....	4-17	4-8

## O

Operating Controls.....	2-6	2-4
Operation:		
Dusty or Sandy Areas.....	2-12	2-15
Extreme Cold.....	2-10	2-15
Extreme Heat.....	2-11	2-15
High Water Areas.....	2-14	2-15
Operating Under Usual Conditions.....	2-7	2-8
Overhaul.....	2-8	2-8
Overhaul.....	2-9	2-8
Operator's Maintenance:		
Indicator's.....	3-9	3-3
Pressure Sight Indicator.....	3-10	3-3
Operation.....	3-8	3-3
Operator's Troubleshooting Chart.....	3-6	3-2

## P

Pressure Regulator Valve.....	5-30	5-24
Pressure Relief Valve.....	5-23	5-18
Pressure Switches:		
Installation and Removal.....	5-21	5-16
Pressure Test.....	6-2	6-1
Preventive Maintenance Services:		
Indicator's Daily.....	3-6	3-2
Installation.....	4-9	4-1

## Q

Quarterly Preventive Maintenance Services.....	4-10	4-1
Pressure Expansion Valve.....	5-29	5-22

## R

Radio Interference Suppression:		
Components.....	4-14	4-6
Installation Methods.....	4-13	4-6
Replacement of Components.....	4-15	4-6
Repair:		
Installation and Removal.....	5-25	5-20
Records and Report Forms.....	1-3	1-1



Purging.....	6-3	6
Servicing.....	6-3	6
Repairing Leaks.....	6-4	6
Report Forms.....	1-3	1
Reporting of Errors.....	1-3	1
Rotary Switch, Mode Selector:		
Installation, Removal and Testing.....	4-42	4
Rust and Corrosion, Removal.....	5-13	5

## S

Schematic Diagrams.....	1-10	1
Service Valves.....	5-22	5
Shims.....	5-10	5
Solenoid Valves.....	5-27	5
Special Tools and Equipment:		
Direct and General Support.....	5-2	5
Organizational.....	4-6	4
Starting.....	2-8	2
Stopping.....	2-9	2

## T

Tabulated Data.....	1-9	1
Temperature Selector Switch:		
Installation, Removal and Testing.....	4-42	4
Testing Electrical System.....	4-32	4
Testing Refrigerant System:		
Leak Test.....	4-52	4
Pressure Test.....	6-2	6
Thermostatic Switches:		
Condenser Fan Motor.....	4-46	4
Heater.....	4-434	4
Thermal Expansion Valve.....	5-28	5
Threads, Damaged; Repairing.....	5-11	5
Time Delay Relay:		
Installation, Removal, and Testing.....	4-39	4
Transformer.....	4-46	4
Troubleshooting:		
Direct and General Support.....	5-4	5
Operators.....	3-5	3
Organizational.....	4-11	4
Tubing and Fittings:		
Inspection.....	4-51	4
Leak Testing.....	4-52	4
Maintenance Instructions.....	5-14	5

## U

Unloading Equipment.....	2-1	2
Unpacking Equipment.....	2-2	2

## V

Valves.....	5-15	5
Ventilation Operation.....	2-8	2

## W

by Order of the Secretary of the Army:

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FORM, FILL IT AND DROP IT IN THE MAIL!			DATE 16 DEC 74	TITLE GENERATOR SET 10 KW NSN 6115-00-231-7286
SECTION NUMBER 5-6115-200-20 AND P		DATE 1 APR 72		
SECTION . . PIN-POINT WHERE IT IS			IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:	
PARA-GRAPH 2-1 a	FIGURE NO. 4-3	TABLE NO.	<p>           In line 6 of paragraph 2-1a the manual states the engine has <u>6</u> cylinders. The engine on my set only has <u>4</u> cylinders. Change the manual to show <u>4</u> cylinders.         </p> <p>           Callout <u>16</u> on figure 4-3 is pointing at a <u>bolt</u>. In the key to fig. 4-3, item 16 is called a <u>shim</u>. Please correct one or the other.         </p> <p>           I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-30. I got a gasket but it doesn't fit. Supply says I got what I ordered so the NSN is wrong. Please give me a good NSN.         </p>	

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